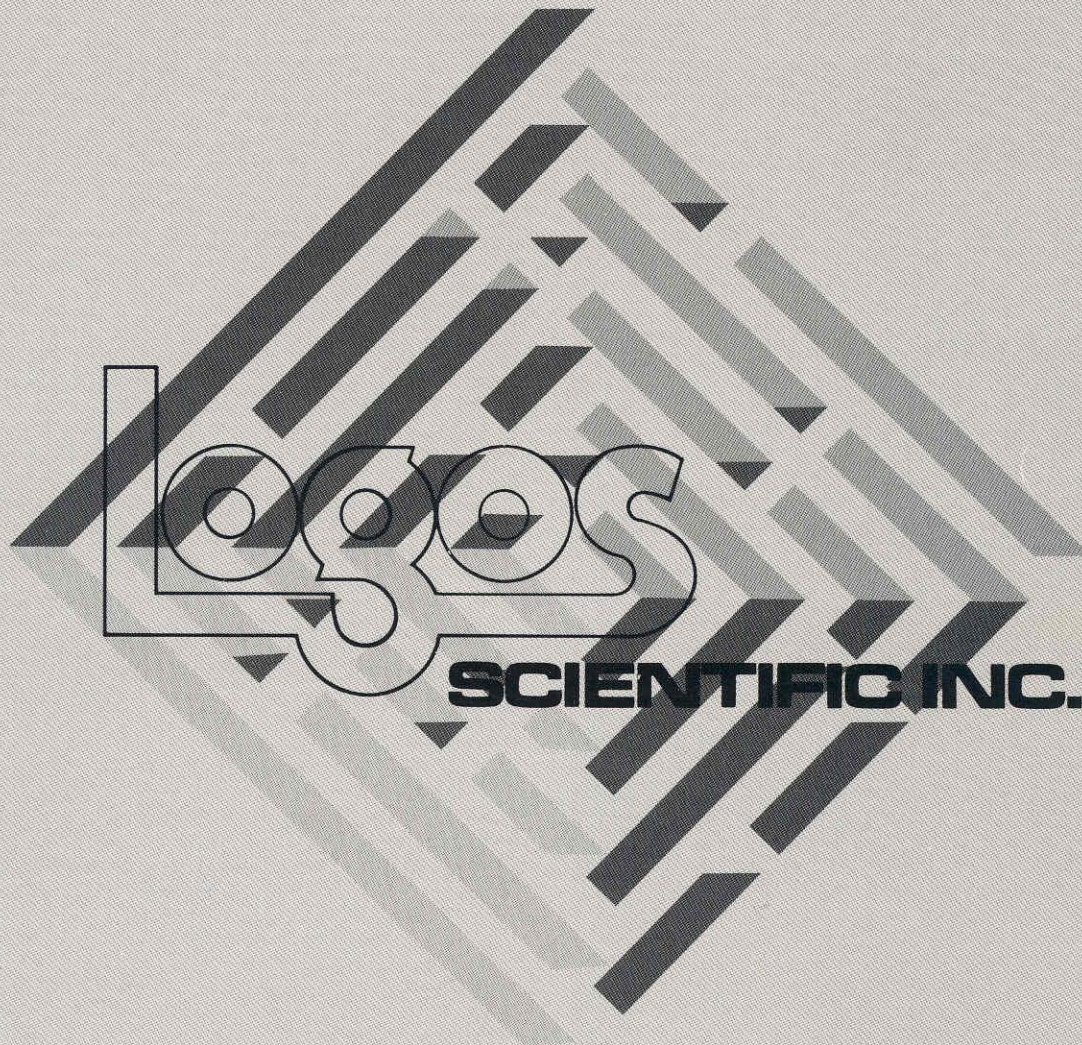


Logos Scientific
Model 820
DIGICLOT II
Operator's Manual

E29



Logos



elvi

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MANUFACTURER'S WARRANTY

LOGOS SCIENTIFIC, warrants to the original buyer only that the instrument at the time of shipment from its plant is in an operable condition and is free from manufacturing defects in material and workmanship. Provided that the registration card is properly completed and returned to LOGOS within ten (10) days of delivery, and provided further that upon discovery within one (1) year of purchase of any manufacturing defect in materials or workmanship, notice is promptly given to the LOGOS Distributor from whom this instrument was purchased, or directly to LOGOS. LOGOS will, at its option, repair or replace such parts determined upon inspection by, and to the satisfaction of LOGOS, to have been defective in materials or workmanship at the time of original shipment, provided the instrument or such defective parts are returned to the manufacturer's plant transportation charges prepaid. All lamps used in this instrument are warranted for a period of 90 days. This warranty does not apply to damage or malfunctions resulting from accidents, misuse or neglect. LOGOS shall not be liable for damages or destruction of the instrument during transit or caused by others. LOGOS reserves the right to make changes in the design of its product at any time without incurring the responsibility to make equivalent changes on equipment previously manufactured. Except as specifically stated above, LOGOS shall not be liable to the Buyer or to anyone else for any bodily or property loss, injury or damages whatsoever, including indirect, incidental, special or consequential damages, whether arising out of or in connection with any materials or workmanship furnished by LOGOS, any defect therein, any representation, warranty or guarantee respecting this instrument or any information derived from the use of the instrument and no matter how the loss, injury or damage occurred, for an amount in excess of the purchase price of the instrument. Such sum shall include amounts for consequential and all other damages. Buyer agrees to defend, indemnify and to hold harmless LOGOS against all claims, actions, proceeding expenses, cost and liabilities asserted against LOGOS by any third party in respect to the instrument sold hereunder, its use or any information or interpretation of information obtained from or during the use of the instrument, and any loss, injury or damages resulting therefrom.

LOGOS makes no other warranties than those stated above and it neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of this instrument.

To exercise your warranty, send the instrument with a photocopy of the dated receipt, freight prepaid to: LOGOS SCIENTIFIC, INC., 700 West Sunset Road, Henderson, NV 89015.

There is no charge for a loaner instrument should an instrument require service during the warranty period. However all freight charges for the loaner and the purchased instrument will be paid by the customer. This includes the freight charges incurred to ship instruments to the customer and those to return the instruments to the service facility.

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1.0 INTRODUCTION

The ELVI 820 DIGICLOT II is a dual-channel precision electronic instrument, with a digital display of results, for the performance of all coagulation tests.

The Elvi 820 DIGICLOT II can be used with any reagent system or any sample. The sophisticated electronic technology used in this instrument design makes analysis completely independent of the characteristics of the plasma under examination as well as the turbidity of the reagents, since an automatic zero setting of the optical density is performed initially on each sample.

The instrument is equipped with an incubation block regulated at 37°C, allowing incubation of 32 cuvettes and 4 bottles of reagents, two of which can be subjected to continuous stirring. In the block, there are also two test wells, with covers, one for each of the two test channels.

The use of the optional ELVI 821 QUICK COMPUTER, a microprocessor digital computer with built-in printer, in combination with the ELVI 820 DIGICLOT II, also provides:

1. The results to be printed in sequence, preceded by an identification number, the type of analysis, and the number corresponding to the channel used.
2. The values in seconds of the prothrombin times (PT) in addition to their corresponding Quick activity percentages.
3. The partial thromboplastin times (PTT) in seconds.
4. The values in seconds for fibrinogen determinations and their conversions to concentrations expressed in mg%.
5. The MEAN to be obtained automatically when analyses are made in duplicate.
6. Conversion of the prothrombin time (PT) to "RATIO", i.e. to the ratio between the time recorded for the test sample and that of the normal reference standard.

INTENDED USE

The ELVI 820 DIGICLOT II is intended for use in the in vitro diagnostic measurement of coagulation function testing. Test procedures are outlined in this manual.

1.1 OPERATING PRINCIPLE

The coagulation process is monitored utilizing a photometric principle. This system of coagulation measurement is sensitive to both positive and negative variations in the optical density of the plasma allowing greater testing capabilities.

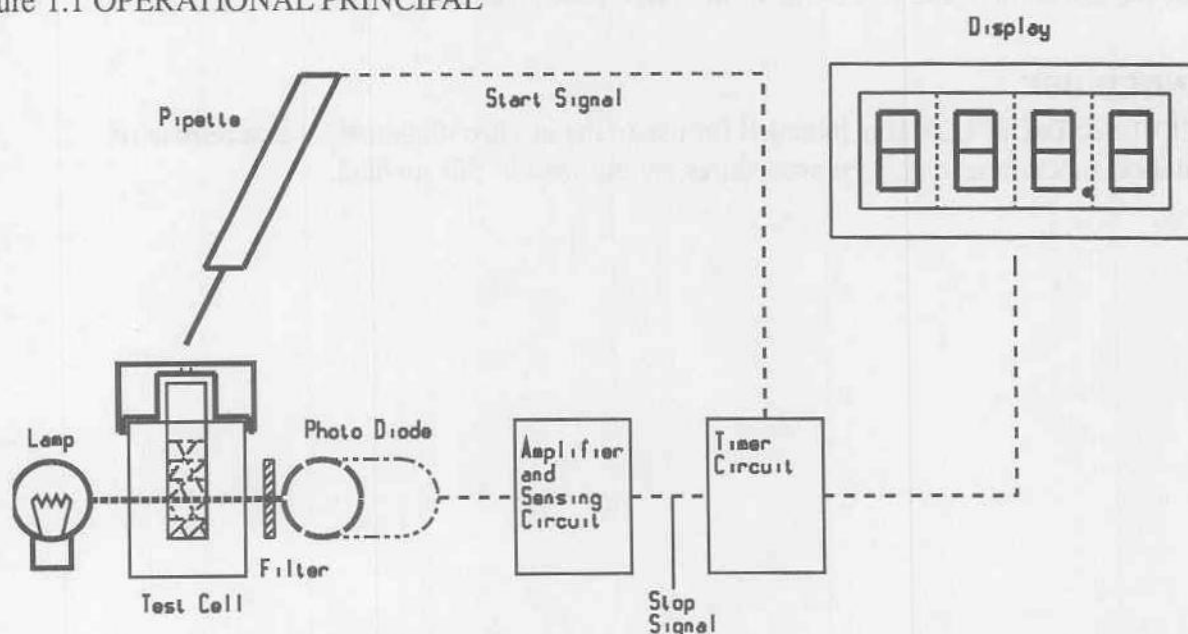
The procedures for the various analyses have been standardized by equipping the instrument with an incubation timer. The plasma or reagent incubation time is selected by means of a digit-switch (time range from 0 to 9 minutes). On pressure of the "TIMER START" key, the set time in seconds appears on the display, and the count-down starts. When zero is reached, after the preset incubation time, a buzzer sounds to inform the operator that the analysis can be carried out. The action of the incubation timer can be cancelled at any time by pressing the RESET button.

The digital timer is started by an electric signal coming from the pipette while delivering the reagents or plasma. A single pipette controls the start of both channels. This method eliminates errors due to delayed starts or non-starts characteristic of instruments with optical start.

There is also an initial blank time of 5 seconds, during which the instrument is insensitive to the turbulent movements occurring in the cuvette during the first few seconds after addition of plasma or reagents. The instrument automatically adjusts the base line (zero point of the blank) and proceeds to monitor the sample for clot formation.

A beam of light generated by a lamp first passes through the cuvette containing the test sample, then through an interference filter at 525 nm. A photo diode monitors the light and detects variations in the optical density of the plasma occurring at the moment a clot is formed. A circuit processing the photometric signal supplies the STOP command to the digital timer (with a resolution time of one-tenth of a second).

Figure 1.1 OPERATIONAL PRINCIPAL



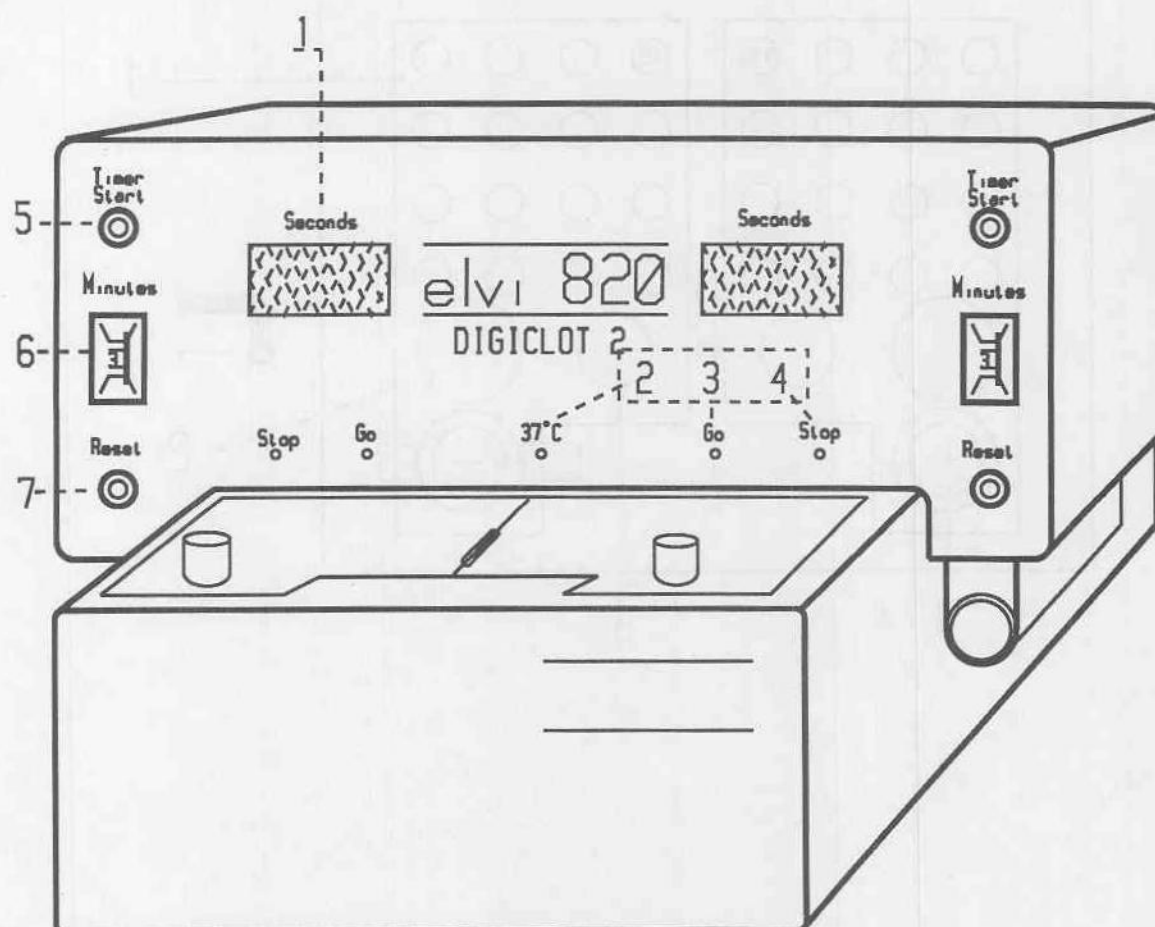
2.0 DESCRIPTION

The following is a description of the operator controls and functional units:

2.1 DISPLAY / CONTROL PANEL (Refer to Figure 2.1)

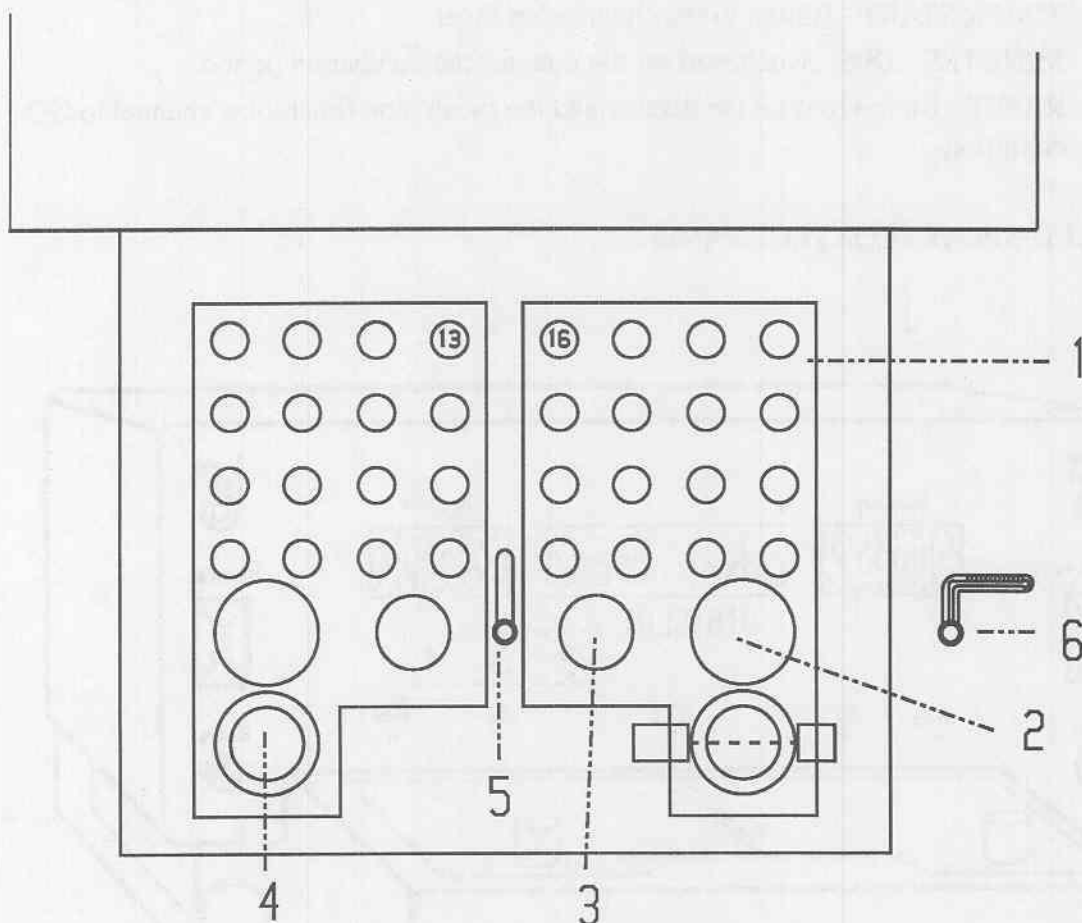
1. SECONDS - Four figure fixed decimal digital indicator.
2. 37°C - Yellow LED flashes when the operating temperature has been reached.
3. GO - Green LED when lit indicates that the channel is ready for use.
4. STOP - Red LED when lit indicates that the channel is not ready for use.
5. TIMER START - Button to start incubation timer.
6. MINUTES - Digit switches to set the time for the incubation period.
7. RESET - Button to reset the display and the incubation timer. Sets channel to GO condition.

Figure 2.1 DISPLAY / CONTROL PANEL



2.2 INCUBATION BLOCK Regulated at 37°C (Refer to Figure 2.2)

1. Thirty-two (32) cuvette incubation wells.
2. Two (2) reagent incubation wells.
3. Two (2) reagent incubation wells with magnetic stir assembly.
4. Two (2) test wells with covers and magnetic stir assembly.
5. Thermometer well.
6. Block Thermometer.

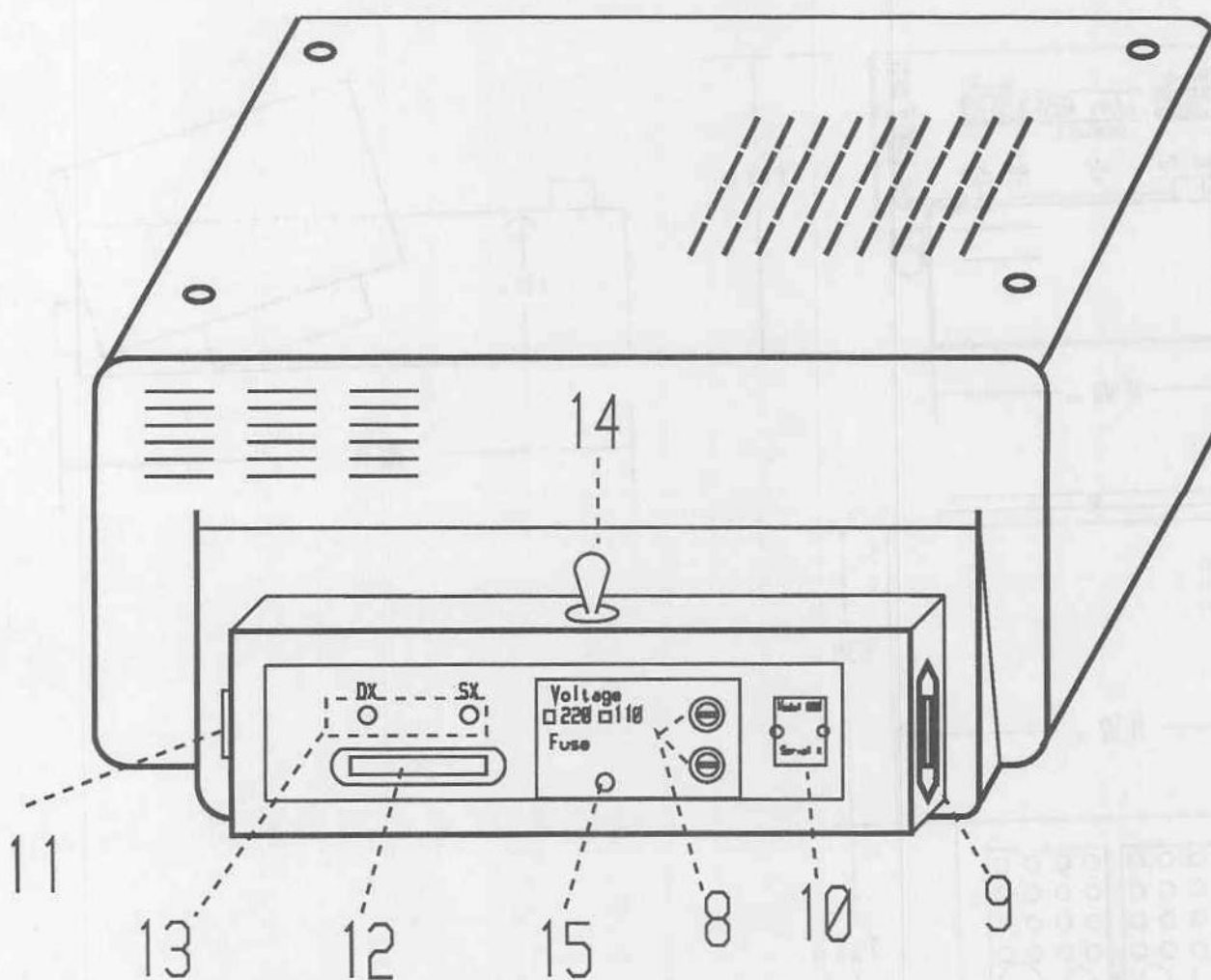
Figure 2.2 INCUBATION BLOCK

2.3 REAR PANEL (Refer to Figure 2.3)

8. FUSE HOLDERS - Houses fuses
9. PLUG - Power cord connection with built-in line suppressor.
10. IDENTIFICATION PLATE - model and serial numbers.
11. OUTPUT - Connector for Pipette.
12. OUTPUT - Connector for 821 Quick Computer.
13. OUTPUT - BNC connectors for dual channel recorder, Elvi 176.
14. ON / OFF SWITCH.
15. GROUND TERMINAL - Supplemental grounding terminal.

NOTE: DX = Right, SX = Left

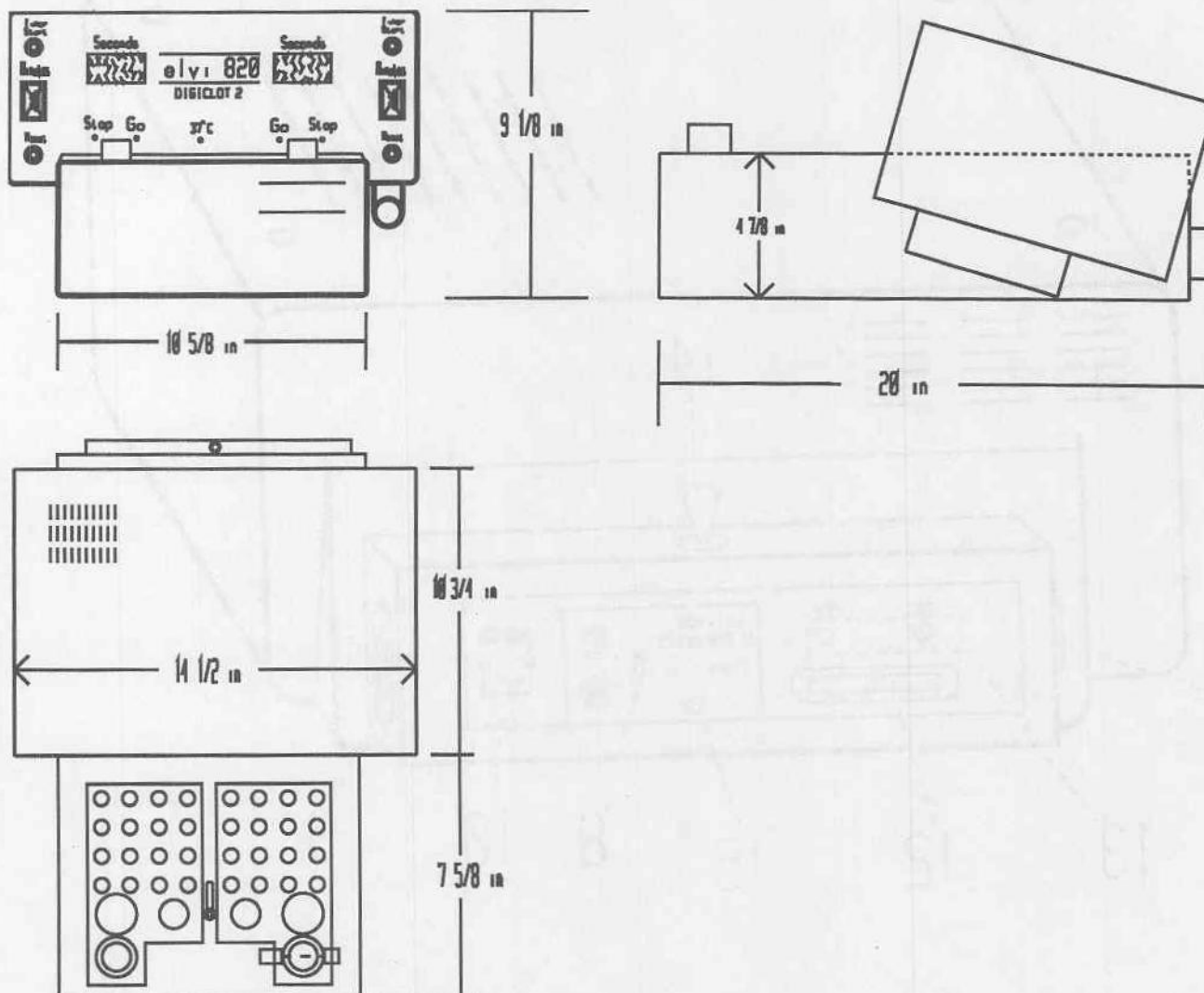
Figure 2.3 REAR PANEL



2.4 TECHNICAL FEATURES

- Power Supply : 110 volts 60 Hz or
: 220 volts 50 Hz
- Fuses : 2 Amp. semi-delayed 110 VAC
: 1 Amp. semi-delayed 220 VAC
- Thermal stabilization : $37^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$
- Agitation Speed : Reagent 600 rpm Sample 300 rpm
- Light Source : 5 v - 190 ma Tungsten
- Detector : Solid State Photo Diode
- Dimensions : 36.0 x 50.5 x 22.5 cm
- Weight : 17 kg
- OutPut for Elvi 821 Quick Computer
- OutPut for Elvi 176 Strip Chart Recorder

Figure 2.4 PHYSICAL LAYOUT



3.0 PACKING, STORAGE, INSTALLATION

3.1 INSTALLATION

1. Unpack the ELVI 820 DIGICLOT II by removing it from its shipping container. While unpacking, check for any damage. If damage has occurred, call LOGOS SCIENTIFIC, INC., and the shipping company. ****DO NOT PLUG THE UNIT INTO A POWER SOURCE**** If no damage exists, continue with the installation procedure.
2. Place the unit on a flat surface and protect it from direct light (to avoid interfering with the detection system of the photo diode). Also allow adequate room for ventilation.
3. **CAUTION:** Verify the power line specifications 115 VAC 60 Hz or 220 VAC 50 Hz. See power requirement tag on back panel. Please note the instrument is usually shipped set up for 115 VAC 60 Hz, conversion will be necessary if the power line is 220 VAC 50 Hz. See MAINTENANCE SECTION for power supply conversion procedure.
4. Plug receptor end of the power cord into the instrument first. Then plug in the power cord into a properly wired outlet. Confirm that the electrical outlet is fitted with an effective ground connection and that the fuse is correctly seated in its housing. *If the instrument is cold, allow it to reach room temperature before turning power on.
5. Attach the electric pipette to the ELVI 820 by plugging the pipette connection end into the 820 connection. Ensure that the connector is threaded correctly and firmly twist it into the connector.
6. If applicable, Insert thermometer and pipette warmer adaptor in incubation block.
7. Switch on the instrument and allow at least 30 minutes for it to warm up before performing an analysis.

3.2 UNPACKING (Refer to Figure 3.1)

The ELVI 820 is packed in a single carton along with all accessories. Unpack the instrument carefully noting damage and position of packing materials.

NOTE: Save all packing materials and packing list for repacking if it becomes necessary.

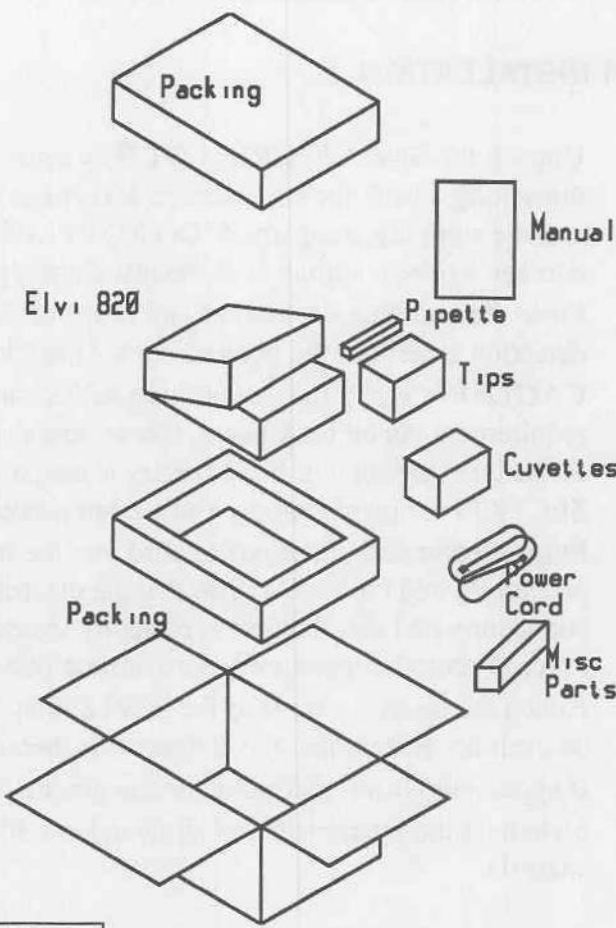
Please use the following check list to ensure your ELVI 820 arrives with the proper accessories and supplies.

	CATALOG #	DESCRIPTION	QUANTITY
1.	960.82000	ELVI 820 DIGICLOT II	1
2.	500.55005	Power Cord	1
3.	705.82002	Operating Manual	1
4.	659.00129	Elect. Adjustable Pipet	1
5.	675.05001	Pipet Tips	1
6.	675.06001	Cuvettes / no stir bars	1
7.	679.00011	Pkg of 500 micro agitators	1
8.	679.00039	Teflon Magnetic Stir bars	2
9.	056.14200	Fuse 2.0 Amp	2
10.	324.80009	Test Well Cover	2
11.	700.00100	Incubation Block Thermometer	1

3.3 REPACKING

Use the packaging materials the instrument was received in. Disconnect power cord and electric pipette. Remove thermometer and tip incubator tray. Place instrument in carton along with accessories in use, see Figure 3.1

Figure 3.1 PACKING



3.4 STORAGE

Store the Elvi 820 indoors in a dry temperature controlled environment. The Elvi 820 requires standard storage conditions for electronic equipment which has been designed for indoor use. Outdoor storage is not recommended. The following minimum and maximum conditions should not be exceeded:

	Minimum	Maximum
Temperature	30° F	110° F
Humidity	20%	80%

If storage has been longer than 3 years or under severe conditions inspect the following:

1. Internal wiring for cracks in insulation and plug connectors.
2. Power cord for crack and defects.
3. Stir Drive Belt and Lubrication, the belt will require service and lubrication.
4. Corrosion on PC board runs or deterioration of PC boards.
5. Pipette - refer to pipette manual.
6. O-Rings on test well.

3.5 POWER SUPPLY CONVERSION TO 220 VAC/50 Hz

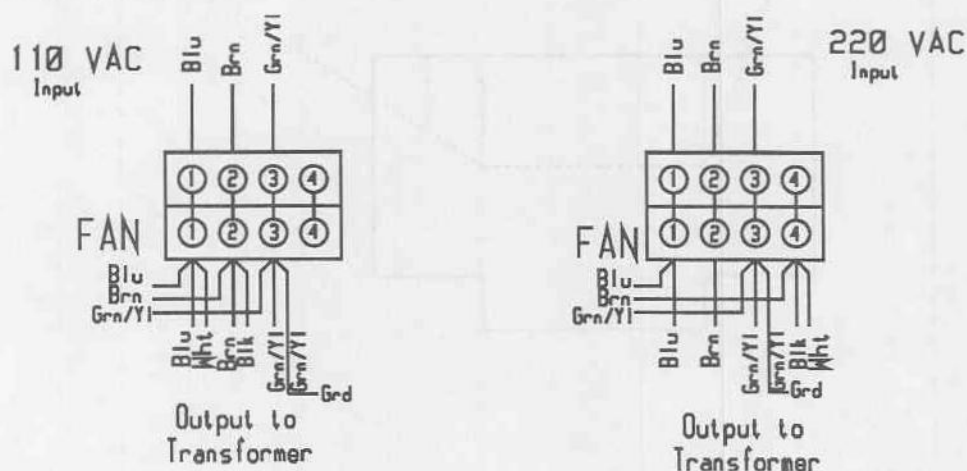
3.5.1 CONVERTING FROM 110 to 220 VAC.

Elvi 820's are shipped wired for 110 - 120 VAC, 60 Hz power supplies. If your line voltage and frequency ranges are 220 VAC, 50 Hz, perform the following steps.

NOTE: Disconnect the power cord.

1. Remove the plexiglass display cover by removing the 6 screws holding it in place.
2. Remove the top cover by removing the 4 screws located on the bottom rail of the top orange cover. Slide the orange cover forward.
3. Remove the rear cover by removing the 4 screws holding it in place.
4. Notice the connector block attached to rear of the fan housing, (see figure 3.5). Terminals 1,2 and 3 each have 3 wires going in to bottom connector. One wire in each of these groups of three goes into the fan. The two remaining wires in terminals 1 and 2 are the primary winding of the transformer wired in parallel. This conversion will require the primary windings wired in series. (115 changed to 220 VAC).
5. Separate the wires and reconnect to block as described (See Figure 3.5).
 - a. Separate the white wire from the 2 blue wires in terminal 1. Replace the 2 blue wires back in the same connector terminal.
 - b. Separate the 3 wires from terminal 2 replace the brown TRANSFORMER wire in terminal # 2.
 - c. Twist the black, brown and white wires together before soldering them together. Insure that the brown wire is from the fan. Place them in the lower unused connector block # 4.
6. Replace the rear cover by aligning the three cover pins in holes provided. Replace the 4 screws.
7. Replace the top cover and display cover.
8. Change fuses as appropriate.
9. Use appropriate power cord.

Figure 3.5 POWER SUPPLY WIRING



3.5 POWER SUPPLY CONVERSION TO 220 VAC/50 Hz

3.5.1 CONVERTING FROM 110 to 220 VAC. (D.O.D. Model)

The D.O.D. Model has a special quick change voltage selector, and pins for frequency selection, conversion can be complete in 15 minutes, with a phillips and regular screw driver. Please replace the following sections in the Manual.

elvi 820's are shipped wired for 110-120 VAC, 60 Hz power supplies. If your line voltage and frequency ranges are 220 VAC or 50 Hz, perform the following steps.

NOTE: Disconnect the power cord.

1. Remove the plexiglass display cover by removing the 6 screws holding it in place.
2. Remove the top cover by removing the 4 screws located on the bottom rail of the top orange cover. Slide the orange cover forward.
3. At the rear of the instrument, near the fan, identify the 110/220 VAC POWER CHANGE SWITCH. Using a screw driver, turn the switch to the desired voltage.
4. Insert the correct fuses. Use 1 amp fuses for 220 V operation, use 2 amp fuses for 110 V operation.
5. Use appropriate power cord.

3.5.2 CONVERTING FROM 60 to 50 Hz. (D.O.D. Model)

The D.O.D. Model has movable selector pins to eliminate soldering.

1. Remove the plexiglass display cover by removing the 6 screws holding it in place.
2. Remove the top cover by removing the 4 screws located on the bottom rail of the top orange cover. Slide the orange cover forward.

NOTE: The following must be done for both the left and right channel PC 7. See Figure 3.7 (PC board locator).

3. Remove the two screws holding PC 7 in place. Carefully remove the 24 pin plug connector for the quick computer. (Upper right hand corner PC 7). Remove PC 7 from instrument.
4. Move the 60 Hz bridge connection from pins 1-3 to the 50 Hz bridge pins 1-2. The bridge is located in the upper center of PC 7. See Figure 3.6.
5. Replace PC 7, Replace 24 pin computer connector, replace retaining screws, replace covers.
6. Use the appropriate power cord.

3.5.2 CONVERTING FROM 60 to 50 Hz.

1. Remove plexiglass display cover by removing the 6 screws holding it in place.
2. Remove orange top cover by removing the 4 screws located on the bottom rail of the top orange cover. Slide the orange cover forward.

NOTE: The following must be done for left and right channel PC 7. See Figure 3.7 (PC board locator).

3. Remove the two screws holding PC 7 in place. Carefully remove the 24 pin plug connector for the quick computer. (Upper right hand corner PC 7). Remove PC 7 from instrument.
4. De-solder the 60 Hz bridge connection (pin 3) See Figure 3.6. The bridge is located in the upper center of PC 7. Solder the jumper to the 50 Hz position (pin 2).
5. Replace PC 7, Replace 24 pin computer connector, replace retaining screws, replace covers.
6. Use the appropriate power cord.

Figure 3.6 BRIDGE LOCATION

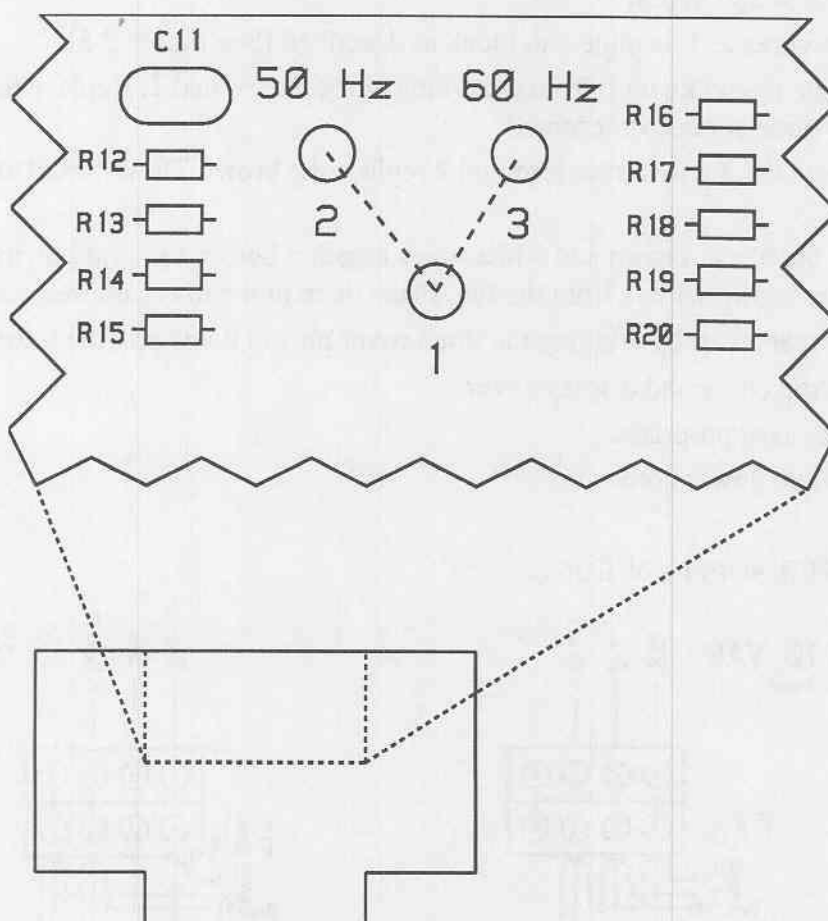
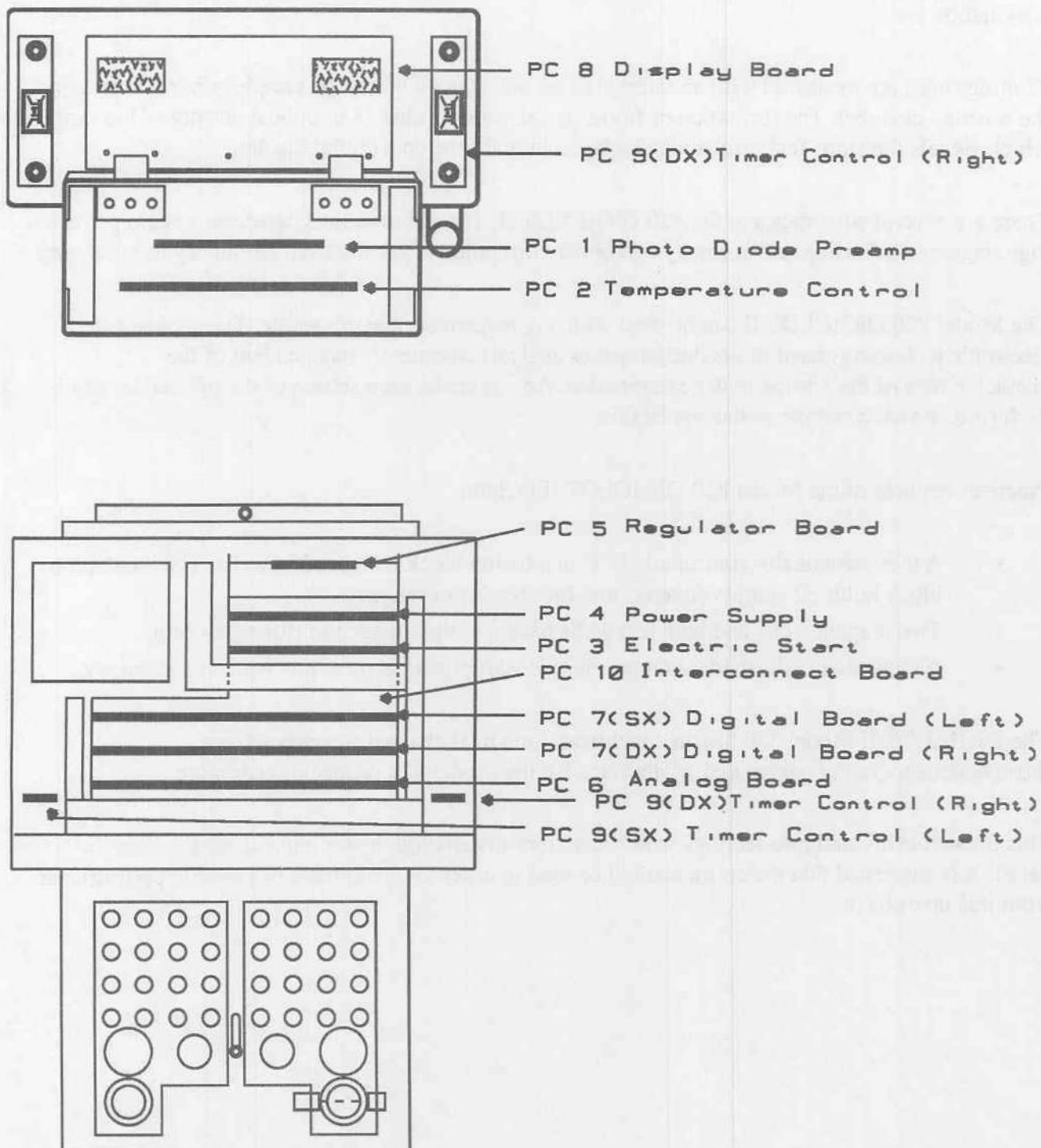


Figure 3.7 PC BOARD LOCATOR



4.0 INSTRUMENT OPERATION

The ELVI 820 DIGICLOT II, coagulation instrument is a dual-channel, electronic instrument utilizing a precision photo optical detection system to perform end point determinations of coagulation tests.

Clotting times are measured with an internal timer that starts when a test sample is introduced into the reaction chamber. The formation of fibrin strands cause a change in optical density of the sample which signals the stop. Test results are displayed in real time on a digital display.

There are several advantages to the 820 DIGICLOT II. The photo-optical detection system permits a high degree of precision and accuracy and better correlation of results from laboratory to laboratory.

The Model 820 DIGICLOT II can be used with any reagent system or sample. The sophisticated electronic technology used in the design makes analysis completely independent of the characteristics of the plasma under examination. An automatic zero setting of the optical density is performed on each sample as the test begins.

Practical features of the Model 820 DIGICLOT II include:

- A thermostatically controlled, 37°C incubation block and reaction wells. The incubation block holds 32 sample cuvettes and four bottles of reagents.
- Two reagent wells and both test wells have a built in magnetic stirring system.
- A convenient adjustable volume, electric start pipette assures precision and accuracy.

The DIGICLOT II Model 820 has an attachment for a dual channel recorder to plot thrombodensitography curves and an interface for the Model 821 printer and computer.

This manual is divided into sections which describes installation, operation and maintenance in detail. It is suggested that the entire manual be read in order to obtain the best possible performance from this instrument.

4.1 GENERAL INSTRUCTIONS FOR COAGULATION TESTING

4.1.1 CLINICAL APPLICATIONS

The evaluation of hemostasis begins with a thorough history and physical examination of the patient. Once the history has been completed, several basic laboratory tests may be used to isolate the hemostatic problem.

1. **Prothrombin Time**

Prothrombin time is the most common test procedure used in the coagulation study. The Prothrombin time (PT) requires the use of tissue thromboplastin to activate Factor VII, along with recalcification of the plasma. It is often thought of as a test of the extrinsic coagulation system. Factor VII is unique to the extrinsic system, so the PT is a good test to monitor oral anticoagulant therapy, since Factor VII is the first factor to be affected by vitamin K-antagonists; oral anticoagulants. Other causes of prolonged PT are congenital deficiencies of Factor VII, X, V, II, or I, vitamin K deficiency or the presence of circulating anticoagulants.

2. **Partial Thromboplastin Time and APTT**

The APTT evaluates the intrinsic coagulation system, as all factors necessary to complete the systems are present in normal plasma. The APTT also evaluates the final common pathway of coagulation. This knowledge tells us that abnormalities of Factors X, V, II or Fibrinogen (common pathway factors) will produce abnormal PT and APTT tests. A normal PT and an abnormal APTT isolates the problem to that portion of the coagulation mechanism specific for the intrinsic pathway. The APTT will also be abnormal in the presence of certain inhibitors or the presence of heparin.

3. **Thrombin Time (Fibrinogen)**

This is a good assay for the evaluation of fibrinogen. When thrombin is added to platelet poor plasma, it converts fibrinogen into an insoluble fibrin clot. The thrombin time will be abnormal when the plasma fibrinogen level is decreased, in the presence of circulating anticoagulants such as heparin or in the presence of fibrinogen degradation products.

4. **Factor Assay Testing**

Most clotting factor disorders are the result of abnormal or decreased production of a single factor. By performing a partial thromboplastin time or a prothrombin time and substitution studies, a specific clotting factor disorder identification can be made.

A number of other tests may also be performed on this instrument. Please follow reagent and procedure outlines.

4.1.2 PREPARATION OF REAGENTS AND CONTROLS

BASIC RULES GOVERNING REAGENTS AND CONTROLS

1. All reagents and controls should be reconstituted with deionized water according to the manufacturer's instructions. It is important that reconstitution instructions of the reagent manufacturer be followed.
2. Use clean glassware and pipettes.
3. Reagents and controls should be reconstituted gently.
4. Reconstituted reagents should sit for at least 15 minutes prior to use for testing. This allows equilibrium to take place. Gently mix prior to using.
5. Run controls in duplicate.
6. Use the same lot number of reagent and control for all the tests. Record the lot numbers and expiration dates for all reagents and controls used.

4.1.3 SAMPLE COLLECTION:

Drawing blood samples for coagulation studies must be done with care. The coagulation factors are activated by difficulty during venipuncture, contact with glass surfaces, using too small of a needle, improper storage and handling, and various drugs or physiological conditions.

Sodium citrate is the anti-coagulant of choice. Mix one part (0.1 M) sodium citrate with nine parts fresh whole blood. When drawing blood with an evacuated blood collection system, use the double tube method: Draw several ml's into a red top tube and discard. Fill the sodium citrate tube to the correct volume. Centrifuge at 3000 rpm for ten minutes. If testing cannot be completed within 1/2 hour, separate the plasma from the cells and store in a labeled tube at 4°C. Refrigerated plasma is stable for four hours.

4.1.4 DAILY START UP

NOTE: Always keep an empty cuvette in the reaction well to avoid accidents. Turn the instrument on. A series of 888.8 will appear in the display window. The equipment is performing an electronic self check. When the check is complete the instrument will display 0.0 and testing may be started.

Before performing test procedures:

1. Verify the instrument operating temperatures.
2. Verify volume setting of the pipette.
3. Perform quality control before testing patient samples.

4.2 DETERMINATION OF THE PROTHROMBIN TIME

Prothrombin time is the most common procedure used in the coagulation study. The Prothrombin time (PT) requires the use of tissue thromboplastin to activate Factor VII, along with recalcification of the plasma. It is often thought of as a test of the extrinsic coagulation system. Factor VII is unique to the extrinsic system, so the PT is a good test to monitor oral anticoagulant therapy, since Factor VII is the first factor to be affected by vitamin K-antagonists; oral anticoagulants. Other causes of prolonged PT are congenital deficiencies of Factor VII, X, V, II, or I, vitamin K deficiency or the presence of circulating anticoagulants.

REAGENTS

It is important that reconstitution instructions of the reagent manufacturer be followed.

Calcium Thromboplastin.

Plasma controls - Normal/Abnormal.

MATERIALS

Cuvettes

Pipette and tips to dispense .1 and .2 ml

TEST PROCEDURE * If instrument is not already "ON", turn the power on, follow the daily start up procedure. Run all samples and controls in duplicate.

1. Place cuvettes for controls and patient samples into the 37°C heat block.
2. Pipette .2 ml of thromboplastin into each cuvette and incubate for 3 minutes (unless otherwise noted by the manufacturer).
3. When the three minute incubation period is over remove the reaction well cover and put the first cuvette with calcium thromboplastin into the reaction well. Make sure that the cuvette is firmly seated and replace the cover.
4. Zero the instrument by pressing the "reset" button. Note that the channel is ready by the green light.
5. With the pipette pick up .1 ml of plasma and wipe the tip while checking for air bubbles, taking care not to touch the lower end. If there are air bubbles present, discard the tip and the sample. Use a new tip to re-pipette another sample until bubbles no longer exist.
6. Insert the pipette tip into the opening of the reaction chamber cover and make sure that the tip is firmly seated.

CAUTION: DO NOT inject reagents or plasma into an empty chamber.

- a. Dispense the sample by depressing the plunger on the pipette to the second stop to start the timer.
 - b. When the timer stops, clot formation has occurred and the PT can be read from the digital display.
 - c. Record the results.
7. Repeat steps 4 - 8 for each sample.

NOTE: When the test has been started on one channel, the second channel is ready to operate: green light on. The second channel operates independently of the first channel so you may perform the same test or a different test on the second channel. You can therefore perform a test in duplicate in approximately the time it takes to perform a single determination or perform a PT and PTT simultaneously.

INTERPRETATION OF PROTHROMBIN TIMES

Each laboratory should establish their own normal ranges.

A PT time between 10 and 14 seconds (depending on reagents used) is usually considered normal.

The test will be prolonged in patients on oral anticoagulant therapy. Prolonged prothrombin times are also seen in the following factor deficiencies: I (fibrinogen), II (prothrombin), V (labile factor), VII (stable), or X (Stuart-Prower). Abnormal results are also seen in patients with vitamin K deficiency, intestinal malabsorption, liver disease, or obstructive jaundice.

Most clotting factor disorders are the result of abnormal or decreased production of a single factor. By performing a prothrombin time, an APTT and substitution studies, the specific clotting factor disorder can be identified.

4.2.1 PROTHROMBIN TIME STANDARD CURVE

The PT test is most commonly used to monitor patients on oral anti-coagulant therapy and is sensitive to factors II, V, and VII. A standard curve is useful to obtain the percent activity if tests are reported as percent. A graph can be prepared plotting the reciprocals of dilutions of plasma verses the PT in seconds. Twenty normal patients should comprise a plasma pool. A new curve should be prepared with each change of lot number in thromboplastin or every six months.

REAGENTS

It is important that reconstitution instructions of the reagent manufacturer be followed.

Calcium Thromboplastin.

Pooled plasma

0.85% Sodium chloride (Buffered)

** Veronal Buffer may be used in place of Saline Solution.

MATERIALS

1.0 ml Serological pipettes

12 x 75 mm Tubes

Test tube rack

TEST PROCEDURE

1. Label four test tubes: 100%, 50%, 25%, and 12.5%
2. Pipette 0.5 ml of 0.85% NaCl into each of the tubes labelled 50%, 25% and 12.5%. The tube marked 100% will not have any saline in it.
3. Using the pooled plasma, pipette:
 - a. 0.5 ml pooled plasma into the tube marked 100%
 - b. Pipette another 0.5 ml pooled plasma into the tube marked 50%. Mix well by gentle inversion.
 - c. Using the serological dilution technique, transfer 0.5 ml from the 50% tube into the 25% tube. Mix well by inversion.
 - d. Transfer 0.5 ml of the solution contained in the cuvette marked 25% to the cuvette marked 12.5%. Mix well by gentle inversion.
 - e. Remove 0.5 ml from the 12.5% tube and discard. The four tubes should all have equal volumes.
4. Following the PT procedure as described in Section 4.2, perform the tests in duplicate for each dilution: 100, 50, 25 and 12.5% use the average for each dilution. The use of a disposable stir bar in the 12.5% dilution will assure more reproducible results.
5. Plot the mean values of times obtained on the abscissa (x axis) and the dilution percentage reciprocal of the plasma on the ordinate (y axis).

EXAMPLE: Example PT times for dilutions and their reciprocal value are given below:

Table 4.1 DILUTION FOR STANDARD CURVE

DILUTION OF PLASMA % RECIPROCAL		PROTHROMBIN TIME IN SECONDS (Typical)
100	0.01	12
50	0.02	15
25	0.04	21-22
12.5	0.08	33-35

The use of the reciprocal values allows the use of a linear scale of the ordinates and consequently simplifies reading of the results.

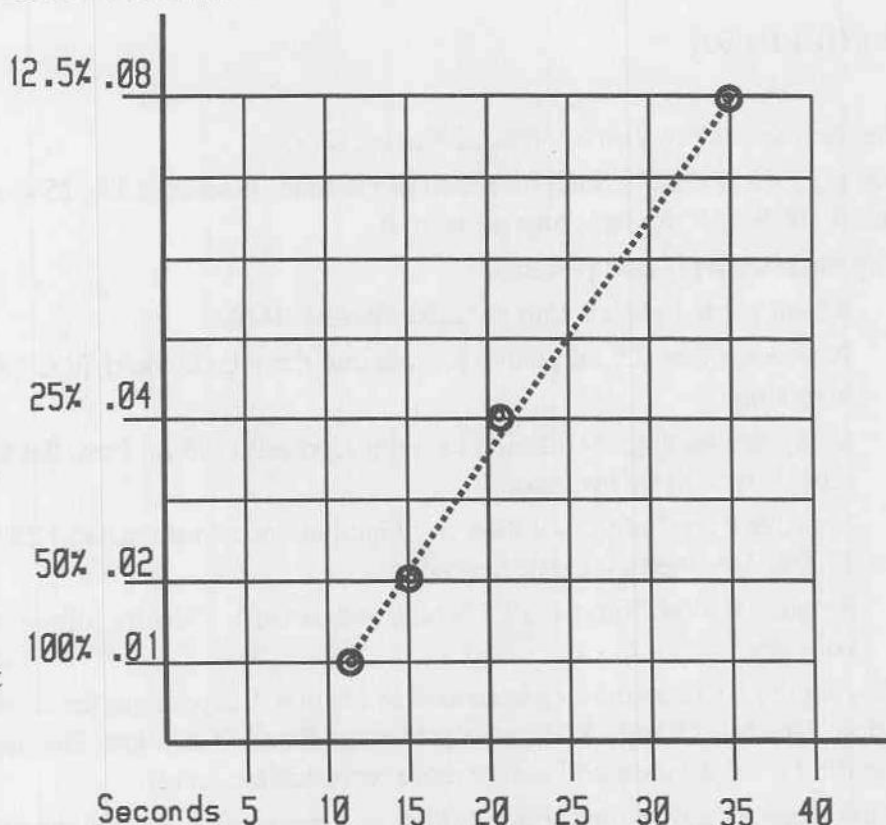
EXAMPLE: standard curve using reciprocal of percent solution percent activity

Figure 4.1 PERCENT ACTIVITY CURVE

Plot reciprocal values
versus time as
demonstrated.

The % activity can be
obtained from this graph
using patient test times.

NOTE: This curve
should be re-plotted for
any change in reagent lot
number.



If the model 821 Quick Computer is attached to the model 820 DIGICLOT II, the 100% and 25% values may be used to set the appropriate values into the computer.

4.3 DETERMINATION OF THE ACTIVATED PARTIAL THROMBOPLASTIN TIME

The APTT test is a screening test for the intrinsic coagulation system. This test is sensitive to all factors except factor VII, factor XIII and platelet functions. The APTT also evaluates the final common pathway of coagulation. This knowledge tells us that abnormalities of Factors X, V, II or Fibrinogen (common pathway factors) will produce abnormal PT and APTT test. A normal PT and an abnormal APTT isolates the problem to that portion of the coagulation mechanism specific for the intrinsic pathway. The APTT will also be abnormal in the presence of certain inhibitors or the presence of heparin.

REAGENTS

It is important that reconstitution instructions of the reagent manufacturer be followed.

APTT reagent

Calcium Chloride

Plasma Controls - normal/abnormal

MATERIALS

Cuvettes

Pipette to dispense .1 ml with disposable tips.

TEST PROCEDURE * If instrument is not already "ON", turn the power on. Follow the daily start up procedure. Run all controls and samples in duplicate.

1. Prewarm calcium chloride in a cuvette in the incubation block.
2. Place cuvettes for controls and patients into the heat block.
3. Pipette .1 ml of APTT reagent into each of the test cuvettes.
 - a. Using a new tip for each sample, pipette .1 ml of control or sample into the cuvettes containing the APTT reagent leaving a 90 second interval between successive samples.
4. Agitate each cuvette to mix the reagent and sample, be careful to prevent bubble formation.
5. Incubate each sample for 3 or 5 minutes as recommended by the reagent manufacturer. (See Pkg Insert).
6. When the incubation period is over, remove the reaction well cover and put the first cuvette with the APTT reagent/sample mixture into the reaction well. Make sure that the cuvette is firmly seated and replace the cover.
7. Reset the instrument by pressing the "Reset" button. Verify channel is ready by the green light.
8. Using a new tip, pipette .1 ml of prewarmed calcium chloride.

CAUTION: DO NOT inject reagents or plasma into an empty reaction chamber.

- a. Insert the pipette tip into the opening of the reaction well cover and make sure that the tip is firmly seated.
 - b. Dispense the calcium chloride by depressing the pipette plunger to the second stop. The timer will start and will stop when clot formation is detected.
 - c. Record the results.
9. Repeat steps 4 - 8 for each sample being tested.

NOTE: When the test has been started on one channel, the second channel is ready to operate: green light on. The second channel operates independently of the first channel so you may perform the same test, or a different test on the second channel. You can therefore perform a test in duplicate in approximately the time it takes to perform a single determination, or perform a PT and PTT simultaneously.

INTERPRETATION OF RESULTS

Each laboratory should establish their own normal range.

A normal APTT runs between 20 and 50 seconds, (depending on type of reagents used).

Prolongation of the APTT indicates an abnormality related to one or more clotting factors except VII and XIII or the presence of anticoagulants such as heparin.

Most clotting factor disorders are the result of abnormal or decreased production of a single factor, usually VIII or IX. By performing a partial thromboplastin time, a PT and substitution studies, the specific clotting factor disorder can be identified.

4.4 DETERMINATION OF FIBRINOGEN

Thrombin Time (Fibrinogen) is a good assay for the evaluation of fibrinogen. When thrombin is added to platelet poor plasma, it converts fibrinogen into an insoluble fibrin clot.

The thrombin time will be abnormal when the plasma fibrinogen level is decreased, in the presence of circulating anticoagulants such as heparin or in the presence of fibrinogen degradation products.

REAGENTS:

Thrombin Reagent

Fibrinogen Calibrator

Owren's Veronal Buffer (pH 7.35)

Patient and control Plasma

For reagent concentration, preparation of samples and the reaction conditions (minimum incubation time), follow the instructions given by the manufacturer of the reagent.

MATERIALS

Cuvettes and Stir Bars

Pipette and tips to dispense .1 and .2 ml

TEST PROCEDURE

1. Prepare the reagents according to the manufacturer's package insert. Introduce a stir bar into the reagent bottle as this helps warm the reagent, and place the reagent bottle in the heat block stirring wells.
2. Put a disposable stir bar into each cuvette and place into the heated wells.
3. Dilute the sample and control 1 : 10 (1 Part sample + 9 Parts buffer) or follow the manufacturer's package insert for the dilution of the plasma.
4. On the selector for the channel to be used, select the incubation time in minutes required for the analysis. It is advisable not to use times shorter than 3 minutes, in order to assure the proper temperature of plasma or reagents. Press the push-button TIMER START for the channel to be used.
5. Pipette .2 ml of diluted plasma into 2 cuvettes and incubate according to reagent manufacturer's directions.
6. Raise the drilled cover of the test well and firmly seat the cuvette in the test well. Put the cover back into position.
7. Once the buzzer sounds to signal the end of the incubation period, ensure that the channel in use is ready (green lamp on). If not ready (red lamp on), press the RESET key.
8. With the electric pipette, pick up 0.1 ml of the Fibrinogen reagent (Thrombin) and insert the end of the pipette into the hole in the drilled cover.
9. Deliver the reagent by pressing the automatic pipette push-button firmly. Be sure to press pipette button to second stop.
10. The second channel will reset automatically, follow the same operating procedure for the second channel. For each channel the timer will start automatically and stop on formation of the clot.

INTERPRETATION OF RESULTS

The normal range of fibrinogen level has been established from 200 to 400 mg/dl, however, it is suggested that each laboratory establish its own normal range limits of confidence and allowable standard deviation with the use of calibration curves or samples of known value. Values should correspond to the ranges set by the reagent manufacturer. Values may be calculated by reading from a reference curve or by calculation from a known value. Care should be used in plotting a reference curve because of the effect it will have on patient results.

If the model ELVI 821 PRINTER computer is attached to your instrument, reference values should be inserted in the proper place to allow the 821 to display time and concentration.

4.5 QUALITY CONTROL

Quality Control is an important consideration in the reporting of accurate results. The use of normal and abnormal controls helps identify reagent and technique problems, and checks daily operation. Each laboratory should establish a routine time (we suggest a monthly check) and log book, to note the accuracy and verification of the following items.

1. **Temp:** With an NBS thermometer check the block temperature. The temperature is set above 37°C. The actual reading will be 37.0 to 37.6°C. This allows for cooling of reagents during transfer, and heating through plastic cuvettes. To check the temperature add DI water to one of the wells numbered 13 or 16 in the rear center of the block. NO CUVETTE. Allow 30 minutes for the water to reach a stable temperature. Dry up the water when done.
2. **Vol:** Check the volume of the pipettes used for .1 ml and .2 ml. Use a balance or spectrophotometric method to check the accuracy.

4.5.1 FUNCTION CHECKS

1. When initially turning on the instrument, the following conditions must be obtained:
 - The display must make the LAMP TEST (888.8)
 - The 37°C lamp must be on without flashing.
 - The STOP lamps must be on.
 - The fan must expel air from the upper part of the instrument.
 - The agitators must rotate without any noise.
2. Ensure that when the preset temperature has been reached, the 37°C lamp flashes regularly.
3. Press the left RESET button and check that the GO lamp comes ON and the STOP lamp goes OFF. The display will read 0.0.
4. Press the pipette button and check that the count starts. The right GO lamp should come on and the right STOP lamp should go off. The right display will read 0.0.
5. In the first 5 seconds, insert an opaque body into the left test well repeatedly and check that the instrument does not stop.
6. Press pipette plunger. The right channel will start counting.
7. With the timer operating, check that the non-significant zeros are suppressed on the display.
8. Ensure that when the RESET button (left and right) are pressed, every digit on the display is blocked or zeroed.
9. After pressing the RESET button, press the TIMER START buttons and check that both STOP lamps light and that the figure entered in minutes on the selector is converted to seconds on the display. The count DOWN must start immediately. When the count has reached 0.0 the sound of a buzzer should be heard, for each channel, and the instrument should have one GO lamp on and one STOP lamp on.

4.5.2 COAGULATION TEST RECAP**TABLE 4.2 COAGULATION TEST SUMMARY**

TEST	SAMPLE VOLUME	REAGENT VOLUME	INCUBATION TIME	NORMAL RANGE
Prothrombin Time	.1 ml	.2 ml Thromboplastin	3 minutes	10-14 seconds
APTT	.1 ml	.1 ml Activator .1 ml CaCl ₂	3 or 5 Min Mfg Suggested time	25-40 seconds
Thrombin Time	.2 ml	.1 ml	Manufacturer's Suggested time	17-24 seconds

****EACH LABORATORY SHOULD ESTABLISH THEIR OWN NORMAL RANGES****

Normal ranges established in one laboratory are not valid from laboratory to laboratory. To set the normal range, plasma from a minimum of 20 normal males and females, i.e., (not on anticoagulant therapy or birth control pills) are tested. The mean and standard deviation is calculated. Test results for plasma from approximately 95% of the normal population would fall within two standard deviations of the mean.

TABLE 4.3 STANDARD DEVIATION**PROTHROMBIN TIMES Thromboplastin Lot #12019**

1. 10.9	11. 12.0	mean = 11.47 (11.5) S.D. = 0.4 C.V. = 0.13
2. 11.0	12. 11.9	
3. 11.9	13. 11.5	
4. 11.3	14. 11.2	
5. 11.3	15. 11.1	The prothrombin time normal range for this laboratory would be 10.6-12.2 seconds Two standard deviations are equal to 0.8, $\pm$ the mean.
6. 11.5	16. 10.8	
7. 11.5	17. 11.7	
8. 11.2	18. 11.6	
9. 11.7	19. 11.9	
10. 12.0	20. 11.4	

4.6 COAGULATION - HEMOSTASIS

In normal situations, hemostasis is the equilibrium between clotting and bleeding that maintains the fluid state of blood within the circulatory system.

Hemostasis is dependent upon three main factors:

1. Functional intact blood vessels
2. Adequate blood coagulation factors.
3. Functional Platelets

The onset of bleeding is usually associated with a vascular defect and a defective clotting mechanism is responsible for the continuation of bleeding.

CONCEPT OF BLOOD COAGULATION

Most clotting factors are enzymes (proteins) or coenzymes that are present in plasma in an inactive precursor form and must be "activated" to become functional in the clotting mechanism. The Cascade theory of coagulation states that all clotting factors are distinct entities in the plasma, synthesized independently and present in the circulation as inactive precursors. Each factor is converted to its enzymatically active form by the preceding factor in a series of reactions similar to a chain reaction.

COAGULATION

For this discussion, coagulation may be represented as occurring in three stages.

STAGE ONE

The formation of thromboplastic activity necessary to convert prothrombin to thrombin. This is produced through the interaction of platelet factor III with factors VII, VIII, IX, XI, XII. When tissue thromboplastin is supplied along with factor VII and Ca^{++} , the extrinsic system has been activated.

STAGE TWO

The conversion of prothrombin to thrombin. Thromboplastic activity produced in STAGE ONE in the presence of factors V and X converts prothrombin to thrombin.

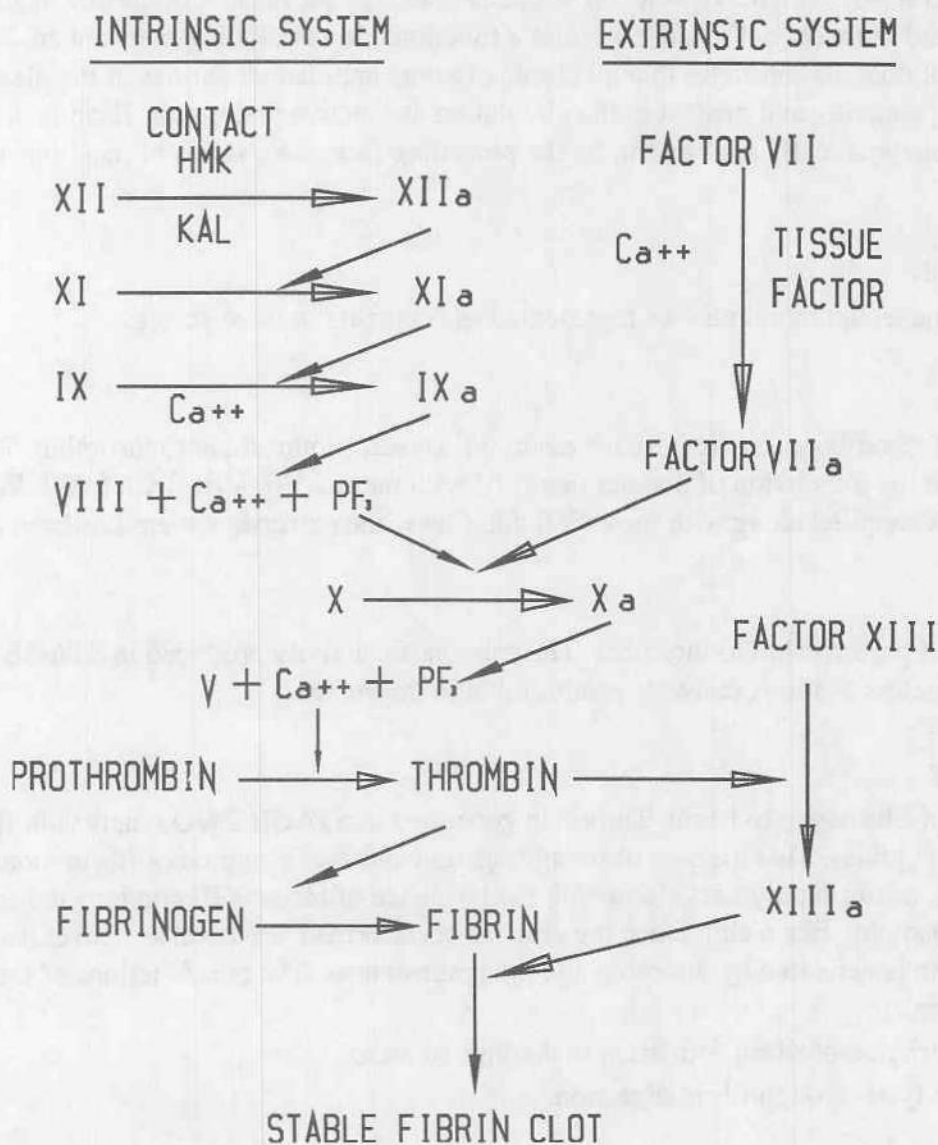
STAGE THREE

The conversion of fibrinogen to fibrin. Thrombin generated in STAGE TWO reacts with fibrinogen to release fibrinopeptides. This triggers fibrin aggregation and the formation of fibrin monomers. The cross-linking of fibrin polymers along with the influence of factor XIII converts the soluble fibrin gel to an insoluble fibrin clot. Once the clot has been formed, a second system called the fibrinolytic system is activated by thrombin and other substances. The two functions of the fibrinolytic system are:

1. Restriction of fibrin formation to the injured area.
2. Clot lysis through fibrin digestion.

BLOOD CLOTTING FACTOR NOMENCLATURE

Factor I	Fibrinogen
Factor II	Prothrombin
Factor III	Thromboplastin (Tissue)
Factor IV	Calcium
Factor V	Ac-globulin, proaccelerin, labile factor
Factor VII	Proconvertin, SPCA, stabile factor
Factor VIII	Antihemophilic globulin (AHG), thromboplastinogen, AHF
Factor IX	Plasma Thromboplastin component (PTC), Christmas factor
Factor X	Stuart-Prower factor
Factor XI	Plasma thromboplastin antecedent (PTA)
Factor XII	Hageman factor
Factor XIII	Fibrin stabilizing factor (FSF)

Figure 4.6 COAGULATION CASCADE SEQUENCE

5.0 OPERATOR TROUBLESHOOTING.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Timer does not start.	Pipette not properly connected.	Disconnect pipette and reattach it according to directions in section 3.0.
	An electrical short in the pipette cord.	Service or replace the pipette. Refer to pipette manual maintenance section.
	Channel was not reset before adding the test sample.	Follow analysis procedure outlined in section 4.0, checking for green "GO" lamp on.
Timer stops short of accepted range.	Bubbles in reagent.	Slowly fill pipette each time above container floor and check for any bubbles prior to each sample introduction.
	Reagent not mixed properly.	Mix reagent and allow to stand for at least 15 minutes to reconstitute, then mix well before each use.
	Too much sample.	Check pipette, clean and change "O" rings. Refer to the pipette manual, maintenance section.
	Shadow over reaction chamber.	Keep hands away from the reaction chamber area.
	Instrument jarred.	Secure instrument on a flat, stable surface.
Timer stops beyond accepted range (or not at all.)	Expired or contaminated reagents.	Mix new reagents.
	Reagents not mixed properly.	Mix reagent and allow to stand for at least 15 min (to reconstitute) then mix well before use.
	Dirty lens.	Reagents have been dispensed into an empty test well. See section 6.0 for cleaning procedure.
	Not enough sample.	Service pipette, clean and change "O" rings.
	Incubation time	Lengthen incubation time and check to see that the sample has reached 37° C.
Cannot duplicate results within accepted range.	Reagents expire or contaminated.	Mix new reagents.

5.0 OPERATOR TROUBLESHOOTING. - Continued

PROBLEM	POSSIBLE CAUSE	SOLUTION
Cannot duplicate results within accepted range.	Widely differing incubation times (PTT).	Allow at least 30 sec. between additions of the normal plasma and at least one min. intervals for pathological plasma.
	Instrument cold.	Allow at least 30 mins. for the instrument to reach operating temperature.
	Reagent not mixed properly.	Mix reagent and allow to stand for at least 15 minutes (to reconstitute then mix well before each addition.
	Pipette is drawing different sample sizes.	Service pipette, clean and change "O" rings. Refer to pipette manual maintenance section.

6.0 OPERATOR CLEANING AND MAINTENANCE

The ELVI 820 is calibrated and tested at the factory. There should be no reason to open the case.

6.1 RECOMMENDED CLEANING

DAILY:

1. Dust instrument.
2. Wash any spills of reagents, plasma or chemicals immediately. Avoid seepage into seams and openings in the covers. This will prevent internal damage. This should include cuvette wells and test well cap. Use distilled water or a mild cleaning agent.
3. Clean reagents and plasma from pipette uptake hold. A wire is provided in the pipette packing material for this purpose. Please refer to the pipette section.

WEEKLY:

1. Lightly lubricate the pipette tips O-rings with vaseline or silicone based grease. It will not be necessary to remove O-rings unless they are damaged and need replacing.

MONTHLY:

1. Clean and lubricate pipette shaft and internal O-ring. Separate pipette at seam in handle. Please refer to the pipette section.
2. Clean shaft with soft cloth. Use a screw driver to unscrew plastic retainer in the tip half of the pipette, the internal O-ring is below this retainer. Clean and lubricate this O-ring. Replace the O-ring and retainer. Adjust the retainer to obtain a good seal between the O-ring and shaft. Reassemble pipette, be sure the tip ejector pins are lined up in their holes.

SEMIANNUALLY:

1. Inspect and clean optics.

NOTE: This may be required more often if reagents are injected into the test well without a cuvette in the test well. Storage of an empty cuvette in the test well will help prevent accidents.

PROCEDURE FOR CLEANING OPTICS ON ELVI 820.

Tools required:	Lens paper	#1 Phillips Screwdriver
	Cotton tip swabs	1.5 mm Hex Wrench

For Service Assistance call LOGOS SCIENTIFIC, (702) 565-1383

Turn off instrument. Remove plug from power source.

1. Remove only the lower front cover by removing the 4 retaining screws.
2. Loosen the center hex screw on the front of the incubation block of the channel to be cleaned. This hex screw is in line with the test well. (See Figure 6.1). ****DO NOT** remove the hex screw.
3. Remove the test well by pulling straight up on the test well.
4. The Optical system will be visible on both sides of the opening in the incubation block.
5. Use cotton tip swabs and DI water to clean off both glass surfaces. Be careful not to use too much water. Dry with lens paper.
6. Replace the test well, be sure the groove in the test well lines up with the hex screw and the test well is fully seated. Tighten the hex screw.
7. Replace the lower front cover.

6.2 PROCEDURE FOR REPLACEMENT OF THE ANALYZER LAMP

This procedure is presented in two parts. The first part explains the replacement of the "TELESCOPE ASSEMBLY" as a pre-aligned unit. The second half details the procedure for replacement of the "LAMP ASSEMBLY" and alignment to complete the "TELESCOPE ASSEMBLY". Pre-assembled "TELESCOPE ASSEMBLIES" are ideal for Laboratories with limited Service Capabilities.

NOTE: Since there are two different types of screws (sheet metal and machine screws of various lengths) used on this instrument, it is recommended that you separate and record the location of the screws during disassembly.

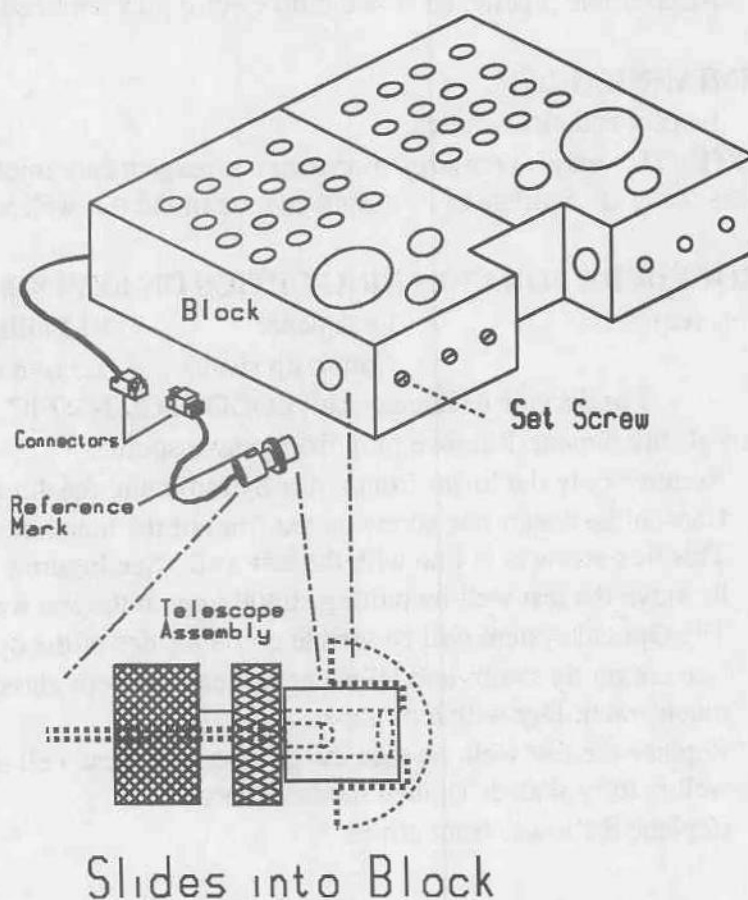
6.2.1 TELESCOPE ASSEMBLY REPLACEMENT

1. Turn the instrument's power switch "OFF" and remove both test chamber covers.
2. Remove instrument covers.
3. This procedure will only detail the left side. The right side is similar with appropriate opposite references.
4. Viewing the incubation block from a left angle, disconnect the lamp plug from the lamp connector. See Figure 6.1.
5. Using a 1.5 mm allen wrench, loosen (Do NOT Remove) the set screw and slide out the telescope ASSEMBLY".

NOTE: During the following step, ensure that the reference mark is kept perpendicular to the base of the instrument.

6. Install the replacement ASSEMBLY and tighten the set screw.
7. Reassemble the instrument by reversing the disassembly procedure. Check that all connectors and screws are in their proper position.

Figure 6.1 TELESCOPE ASSEMBLY



6.2.2 LAMP ASSEMBLY REPLACEMENT

1. Perform steps 1 to 5 of the "TELESCOPE ASSEMBLY REPLACEMENT" procedure.
2. Unscrew the internal ring nut from the lamp support and remove the lamp assembly.
3. Using an allen wrench, loosen the lamp collar and slide it and the internal ring nut off of the lamp. Reassembly the lamp collar and internal ring nut on a new lamp.

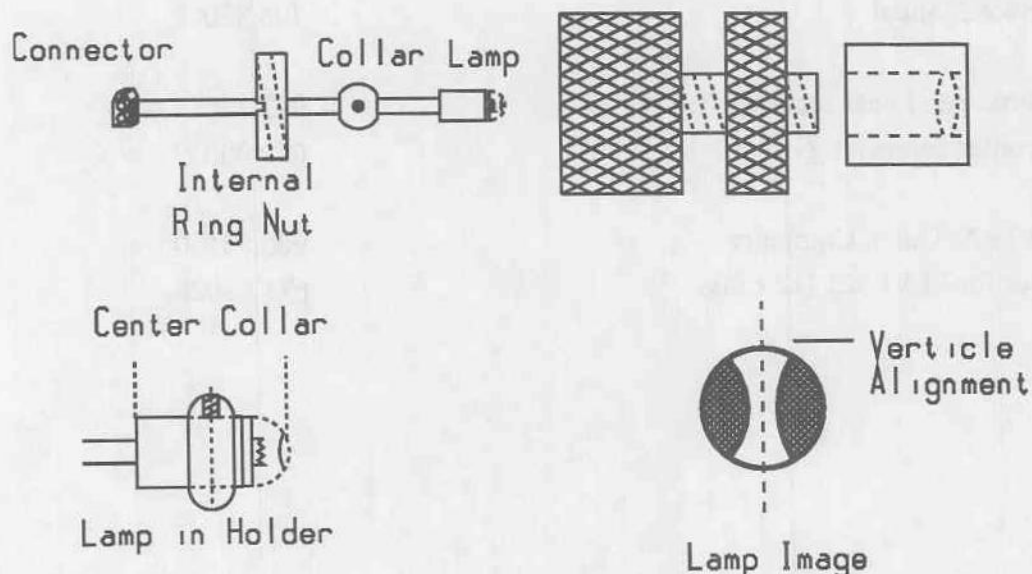
NOTE: The lamp collar must be centered between the lamp base and tip of the lamp lens for maximum flexibility during the "TELESCOPE ASSEMBLY ALIGNMENT" procedure.

4. Insert the lamp and collar back into the lamp support and loosely secure the internal ring nut.
5. Re-connect the lamp plug to the lamp connector, then turn the power switch "ON".
6. Secure the telescope to the lamp support with the external ring nut. TELESCOPE ADJUSTMENT Needs to be performed with a DVM to adjust for maximum reading from the photo diode - Amps. (PINs A or B -D) 3.1 - 3.7 (300 mV Maximum difference between channels. Use TP4 for left, TP15 for right lamp amplitude peaking adjustment. TP1 will be common Ground. These Test Points are located on PC 6, Analog Board. See Figure 3.7 for Location.

IMAGE ADJUSTMENT

7. Holding the face of the telescope approximately 2.5 cm (1 in.) away from a flat surface, loosen the internal ring nut and adjust the position of the lamp until the projected image has a vertical axis, as shown in figure 6.2. Tighten the internal ring nut locking the lamp. Check to see that the image was maintained.
8. Rotate the whole "TELESCOPE ASSEMBLY" until the axis of the image is perfectly vertical, make a reference notch on the top of the lamp support.
9. Proceed with STEP 6 of the "TELESCOPE ASSEMBLY REPLACEMENT" procedure.

Figure 6.2 TELESCOPE ASSEMBLY ALIGNMENT



7.0 ACCESSORIES AND DISPOSABLE MATERIAL

The below listed supplies and accessories may be ordered from your local distributor or from Logos Scientific.

DESCRIPTION	CATALOG #
ELVI 820 DIGICLOT II	960.82000
.1 ml ELVI pipette	941.97000
.2 ml ELVI pipette	941.97100
Package of 5 magnetic stir bars	679.00009
Box of 1000 cuvettes/no stir bars	675.06001
Box of 1000 pipette tips	675.05001
Package of 500 micro agitators	679.00011
Work station	658.00108
Adjustable pipette - Electric start	659.00129
Pipette Tip Warmer Adaptor	600.11037
Incubation Block Thermometer L90 Degree	700.00100
Plastic cover 820	453.10047
Power Cord 110 VAC	500.55005
Power Cord 220 VAC	148.20001
Cuvettes w/Stir bars	675.06025
Fuse 2.0 Amp (for 110VAC)	056.14200
Fuse 1.0 Amp (for 220VAC)	056.14100
Test Well Cover	324.80009
Operators Manual	705.82002
Service Manual	706.82002
Double-pen linear recorder (L 176)	942.17607
Recorder connecting cable	659.00033
ELVI 821 Quick Computer	960.82100
Paper for ELVI 821 (12 rolls)	675.01028

Logos Scientific
Model 820
DIGICLOT II
Service Manual

Date of Revision
January 1989

Logos Scientific
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Henderson, Nevada 89015
(702) 565-1383

10.0 THEORY OF OPERATION

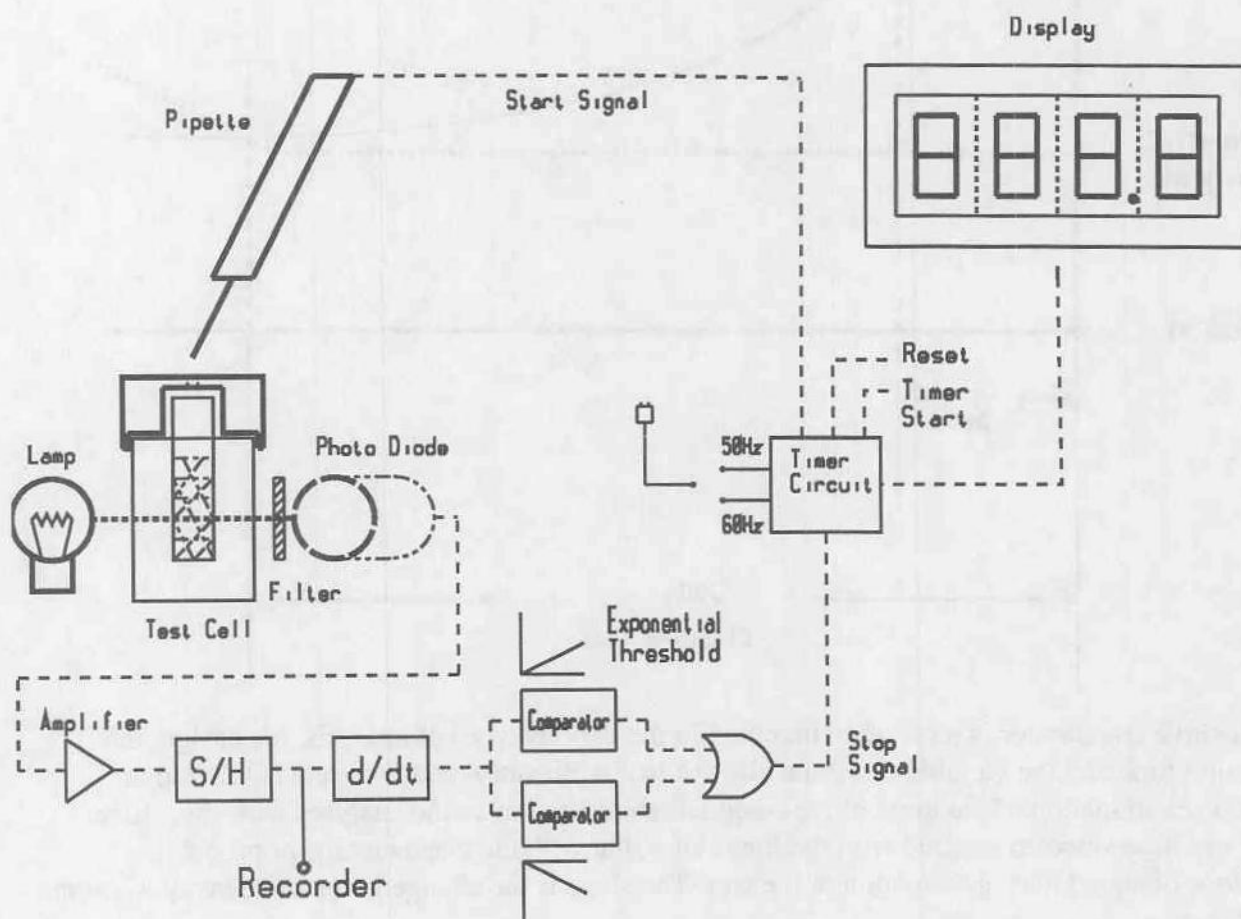
10.1 OPERATION PRINCIPLE

Refer to Figure 10.1 showing the operating principle of one channel.

The beam of light generated by a tungsten lamp, concentrated by a biconvex lens and limited by a circular slit, strikes the reaction cuvette. The optical characteristic obtained is read by the photo diode after it is rendered monochromatic by a green filter at 525 nm.

The photo diode converts the variations in light transmitted to optical density, and the electrical signal obtained is filtered and applied to a sample and hold circuit which adjusts the initial signal (Blank) during the first 5 seconds (protection time), thus allowing only the variations around this value to be measured. The measured time from the instant at which a reagent is mixed with the plasma, start, until the moment at which clotting occurs, as identified by a change in the rate of variation in optical density.

Figure 10.1 ELVI 820 BLOCK DIAGRAM.

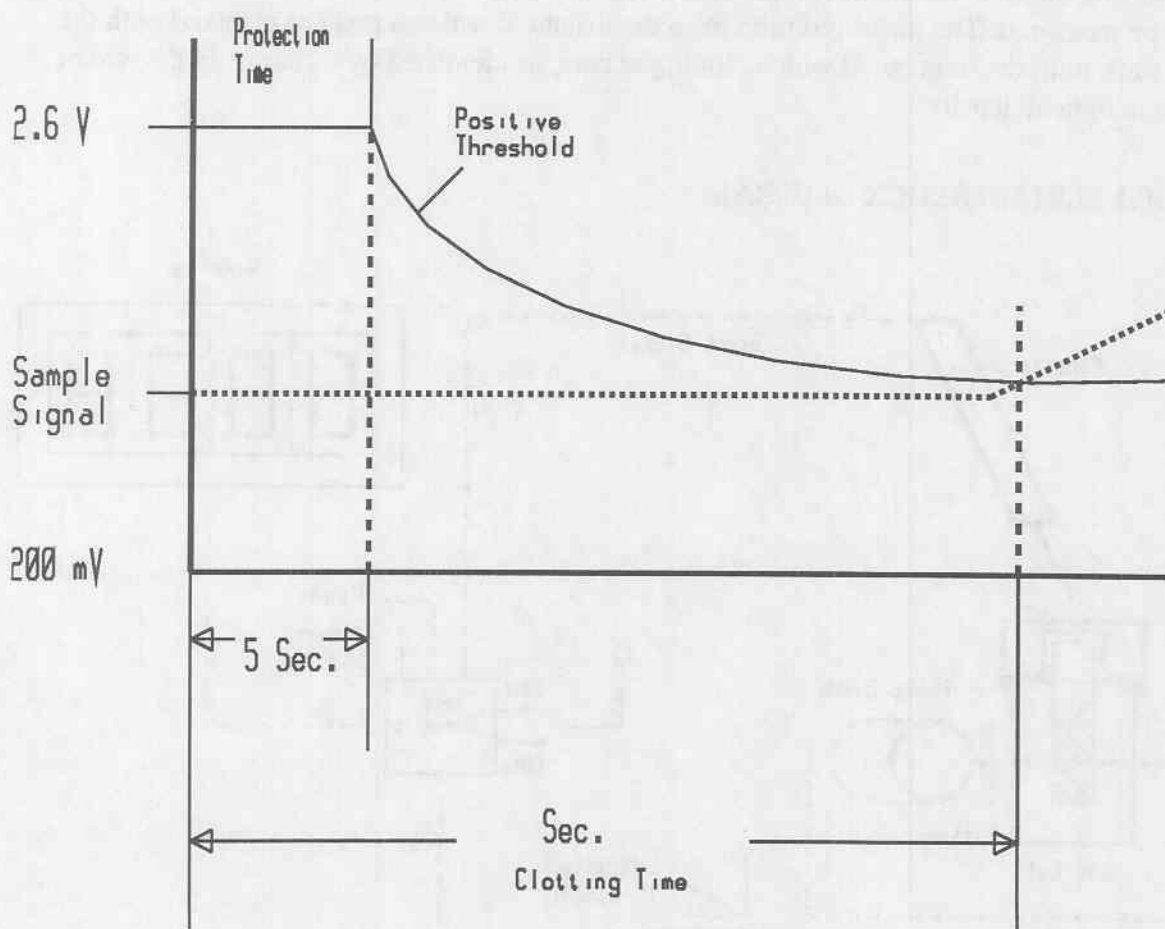


The 5-second period from the starting instant (See Figure 10.2) is defined as protection time in order to prevent any turbulence, from reagent addition to the cuvette, from generating false STOPS.

At the output of the sample and hold circuit, the signal is applied to a differentiator which can supply output levels proportional to the voltage variations over time (gradient of curve). The two comparators determine these thresholds, one for the positive variations, and the other for the negative variations.

The comparator for the positive variations, unlike the negative one, has a variable threshold with exponential trend as shown in Figure 10.2. This allows for greater sensitivity to abnormal clotting times.

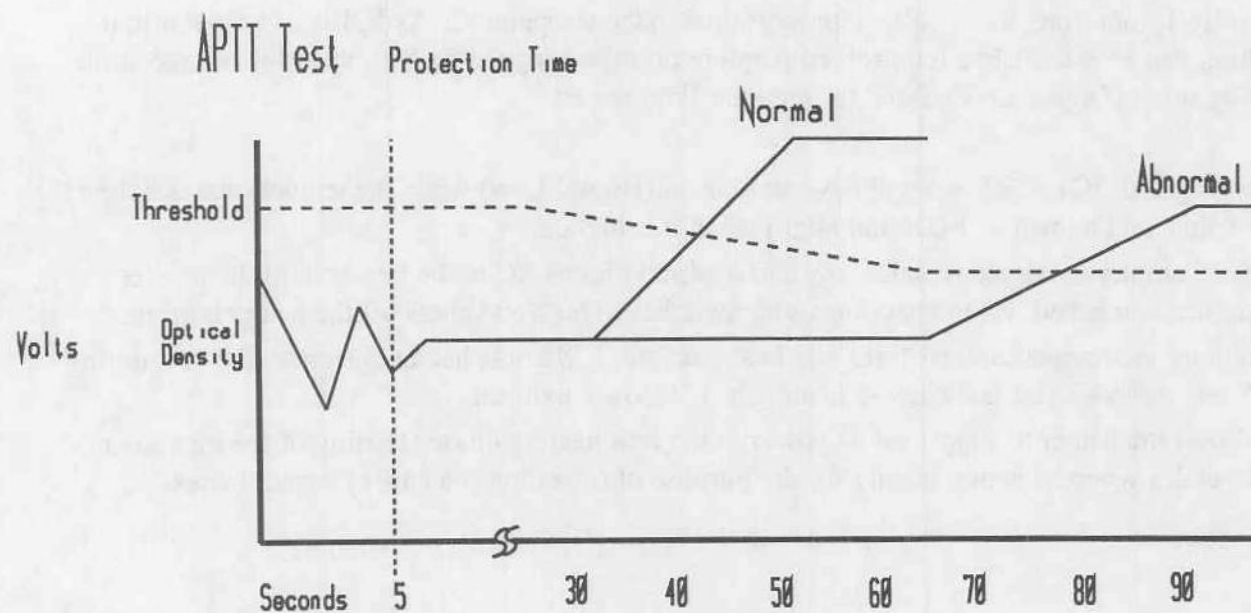
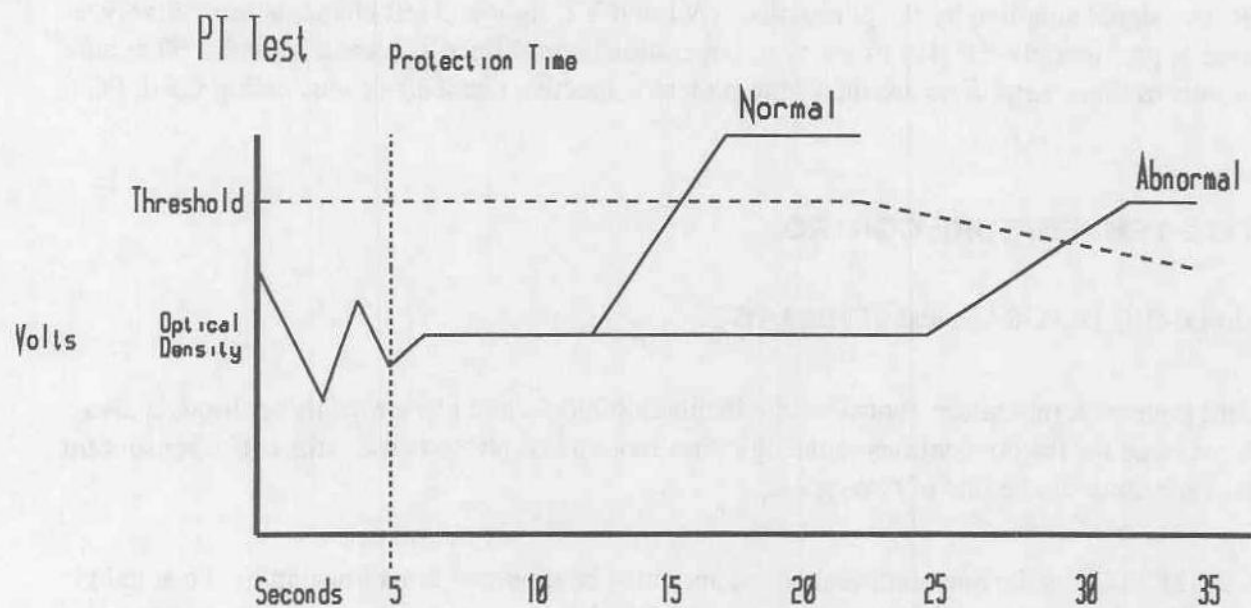
Figure 10.2 POSITIVE THRESHOLD VALUE.



The positive comparator is most often involved in the various types of analysis, it's design, the protection time and the variable threshold allow it to significantly reduce false STOPS due to artifacts. Examination of the trend of the coagulation curves shows the analyses with short times have very high slopes compared with the long times, but with the disadvantage of probable variations of signal during formation of the clot. The slope is the change in optical density when the clot forms.

The timer displays the time in seconds from the instant the reagent or plasma is put into the cuvette, Start, to the instant the clot forms, Stop.

Figure 10.3 EXAMPLES OF CLOT RECORDINGS.



10.2 PC 1 PHOTO DIODE PREAMP

Refer to PC 1 SCHEMATIC.

The electric signal supplied by the photo diodes V1 and V2, right and left channels respectively, is amplified approximately ten (10) times by the operational amplifiers IC1 and IC2 with FET inputs. The outputs of these amplifiers are then sent to there respective channels of the Analog Card, PC 6.

10.3 PC 2 TEMPERATURE CONTROL

Refer to LOGIC DIAGRAM and SCHEMATIC.

This card governs temperature control of the incubation block, and in view of its position, is also used as passage for the connections to the agitation motors and photometric lamps. The sensors for thermal variations can be one of two types:

1. IC9 LM 334 H is the one commonly used and must be mounted in its housing with a suitable insulating disc since the tip is connected to the "V-" Pin. Its output characteristic, measured at point R of the sensor selection bridge, is 10 m V/K. As an example, if the temperature is 27°C, Voltage at point B is 3 volts. ($^{\circ}\text{C} + 273 = \text{absolute } ^{\circ}\text{Kelvin}$)
2. IC9 AD 590 is a component supplying linear current variations with temperature (1 u A/K) and its characteristic at point A (TP1) of the selection bridge is similar to the preceding one, 10 m V/K.

Pin 2 of IC1; therefore, has a voltage proportional to the temperature. As IC1 is a comparator, its switching can be established (control temperature point) by regulating the threshold voltage at the inverting input (Digital Low), Pin 3 through the Trimmer P1.

On the output of IC1 (TP2) we will have an O level (Digital Low) when the temperature is below the preset value, and a level of 1 (Digital High) when it is higher.

The IC1 Comparator signal remains low and feeds continous AC to the heater until the pre-set temperature is reached, when the comparator switches to high and shuts off the heater current.

Maintaining the temperature requires less heat therfore, IC8 limits heater current to 3.5 sec. during each 5 sec. period if IC1 goes low indicating a .1 °C low condition.

This allows the heater to supply all its power in the first heating phase (starting of the instrument) and about 2/3 when its action is only for the purpose of offsetting the unit's thermal losses.

Operation of the circuit is as follows:

When the instrument is turned on, the binary input to IC7 receives a Clear from the initial Reset circuit (IC6 Pins 11, 12, 13), which puts its outputs at $Q = 0$; $Q' = 1$.

In these conditions the modulating Clock IC8 (output 5) is inhibited, while the logic OR formed by IC5 (Pins 4,5,6 & 8,9,10 & 11,12,13) supplies an actuating signal to NAND, IC6 (Pins 1, 2, 3).

When the preset temperature is first reached, TP2 will go to level 1 and hence binary IC7 (input 6) will switch its outputs to $Q = 1$, $Q' = 0$.

In these conditions the modulating Clock can control the heating phase by inhibiting IC6 (Pin 2) for 1.5 seconds and actuating it for 3 seconds.

This particular system leads to relatively fast times in first reaching the operating temperature, and to minimal swing during steady operation as a result of excess heater power merely to offset the small thermal loss of the incubation block.

On the output of binary IC7 (Pin 1) the Reset of Clock IC8 (Pins 4 and 10 are also connected. This supplies a frequency, divided by two by (IC7, to the "37°C" LED), which will indicate the equilibrium state.

We therefore have:

LED on = initial heating state

LED pulsating = thermostatic controlled temperature reached

The heater control circuit operates entirely on alternating current and is electrically insulated by the optic coupler, IC2.

The items belonging to it are:

IC3 ZERO CROSSING circuit allowing actuation of the heater only when the main power source sinusoid is at potential 0.

IC4 Allows the TRIAC to be turned off, which would not occur owing to the extra voltage generated by the heater at the moment it is turned OFF.

10.4 PC 3.4 ELECTRIC START CARD

Refer to PC 3.4 SCHEMATIC.

This part of the circuitry is responsible for the formation of the RESET and START signals for both digital cards. It also controls the START priority of one channel in relation to the other in accordance with the initial selection.

Initially, when the instrument is turned on, certain conditions are set to allow selection of the first channel to be energized. Afterwards this will be possible only by pressing one of the RESET buttons. The initial conditions are as follows:

1. A positive pulse occurs at IC1, pin 3 (TP2) thus resetting the right and left channels, IC9, pins 12 and 4 respectively.
2. The outputs of IC11, pins 10 and 11 are low, therefore both GO LEDs are off and the STOP LEDs are on.
3. Logic highs at IC2, pins 6 and 8 enabling the TIMER START signal.

If the left channel reset button is pressed, a transition will occur on both inputs of IC9 due to the change in output of IC6, pin 11 or IC5 if the right channel is selected.

Without an inhibit condition at IC5, pin 11, which is also in a reset condition, the left channel will reset. The channel is now ready as the GO LED will indicate (output of IC11, pin 11). A timer start pulse from the electric pipette is fed back to IC8, pin 12, causing a transition of IC9, inhibiting any further START signals to the left channel and initiating a RESET signal for the right channel (pin 14, IC9). The right channel GO LED will be on as the left channel is in a STOP condition. This inter-relationship between the two channels sets a cycle which will continue as tests are started and stopped. At any time during a test or incubation period an abort is desired, pressing the RESET button will provide an over-ride condition at IC6, pin 11 for the left channel and IC5, pin 3 for the right. IC1, pin 10 (TP1) is a 1 KHz clock to latch changes of state for IC9.

The last function of PC 3.4 is operation of the incubation timer. The incubation counters (PC 7) can only be started from the reset condition. When the push button is operated the signal is supplied to a monostable IC3 through AND gates of IC2. This monostable supplies a pulse to load the counters and count down.

10.5 PC 4 / PC 5 POWER SUPPLY

Refer to Schematic.

The two cards listed form the instrument's power supply. Card PC 4 has the rectifier circuits and filters; PC 5 has the voltage regulators.

The power supply devices are extremely simple. They are formed by active elements, VR1 and VR2, which take in the rectified and filtered voltage and stabilize for the output.

The only particular feature consists in VR2, which, being a variable output voltage regulator, is programmed to supply 12 V through resistances R6, R4 and R5.

Refer to TABLE 10.1 for an explanation of the power supply outputs.

TABLE 10.1 POWER SUPPLY OUTPUTS

PIN #'S	VOLTAGE	DESTINATION
1, 2	24 VAC	Stirrer motors, Heating glow-plug
4	+5 VDC	Pipette connection, Photometric Lamps
		Printing Computer output buffers
A, B, C	Digital GND	
9, 10	+12 VDC	Analog Card
5, 6	-12 VDC	Analog Card
H, J	Analog GND	
3	3 VAC 60Hz	Synchronizing signal for the timers
L, K	+12 VDC	Digital & Display IC's
D, E, F	Digital GND	

10.6 PC 6 ANALOG BOARD

Refer to PC 6 Diagram and Schematic.

The ANALOG BOARD contains the circuits for the two channels, as well as the filter for the analog power supply. This circuitry increases immunity from noise generated by the power supplies, and provides better interchangeability between preset cards.

Since the two channel circuits are mirror images, the circuit description will be of the right channel or lower portions of the Diagram and Schematic.

The signal generated by the photo diode amplifier (PC 1) is applied to the low-pass filter, IC8. (The PC 1 input can be seen at TP15). The output signal of IC8, pin 7 (TP18) is applied to the SAMPLE and HOLD circuit. Referring to the Schematic the SAMPLE and HOLD circuit consists of the following:

Item	Function
Q4	analog circuit breaker
Q6	control for Q4
C18	analog memory
IC7	emitter - follower
IC8	non-inverting summing amplifier

At TP17, the signal present is at a logic low during the first 5 seconds (sample time) (Q4 open), while in the following seconds (Q4 closed) the optical density variation due to clot formation will be present.

The signal on TP17 is applied to two circuits. First, to the amplifier for the recorder, formed by two sections of IC10, input pin 12 and the final output to the recorder at pin 8. Secondly, to the differentiator IC9, which discriminates the voltage variations in time, shown in Figure 10.6 as a frequency.

The differentiator is also provided with a Reed Relay "K", which discharges the capacitors during the protection time. Its actuating signal is the same as Sample and Hold. (TP24).

The output at TP19 is applied to two comparators:

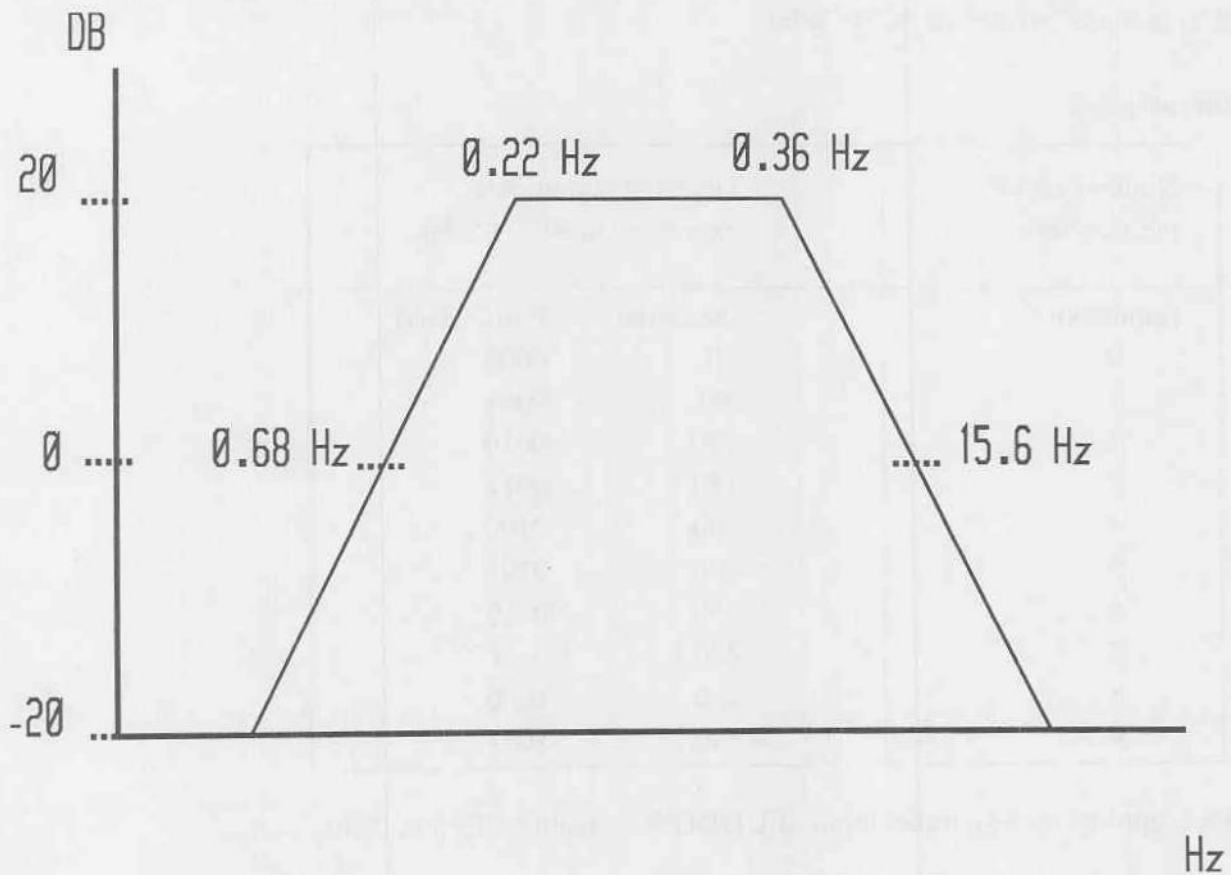
The first, IC12, is active when the voltage relating to the derivative drops below the negative voltage present on TP20. The second IC11 is provided with an exponential threshold, as already described, and seen in Figure 10.2. The signal on TP24 at logic level "1" charges the capacitor.

During the protection time, discharge will occur when TP24 switches to logical level O. The final threshold voltage value of the discharge will be established by the voltage set with P8, below which the capacitor C27 will no longer be able to discharge.

The voltage on TP21 is the trip threshold for the positive values.

At TP22 and TP23 there is a logical OR formed by CR4 and CR5, which supplies the STOP signal to the digital timer, whether the change in the optical signal due to the clot was positive or negative.

Figure 10.6 DIFFERENTIATOR FILTER GAIN VALUES



10.7 PC 7 DIGITAL BOARD

Refer to Schematic.

The DIGITAL BOARD contains, for each channel, all the circuitry required for the timer and the incubation time. At the output we also find the control signals connected to the analog card and the outputs for the computer printer.

To aid in the circuit description, we will follow a complete analysis.

The incubation time is set, in minutes, on the BCD selector thumbwheel switch. This time is converted to decimal code by the decoder IC38, pin 10(A), 13(B), 21(C) and 22(D). At its output there is another decoder formed by diodes CR1 to CR15, which proceeds to convert the data from decimal to seconds (written in BCD Code).

Therefore we have:

Number set on the selectors	Decoded output data expressed in BCD Codes:	
(minutes)	(seconds)	Pin(DCBA)
0	0	0000
1	60	0001
2	120	0010
3	180	0011
4	240	0100
5	300	0101
6	360	0110
7	420	0111
8	480	1000
9	540	1001

This data is applied to the parallel input of UP/DOWN counters IC33 to IC36.

There is a clock connected to the serial input of the counter (CP). The clock is generated by a Schmitt Trigger consisting of Q1, Q2 and the programmable counter IC15, allowing the power line frequency to be converted to 10 Hz. With this frequency it will be possible to obtain timer readings with a resolution of 0.1 seconds. On IC15 there is a bridge allowing input frequencies to be 50 or 60 Hz, always with 10 Hz at the output.

If the TIMER START button is now pressed, a pulse from input Y of the connector is applied to flip flops IC16 pin 10 and IC16 pin 6.

Output, "Q" of IC16 pin 15 determines the SET of IC32 (pin 9), which in turn gives an output signal for the Analog Card, to determine the opening of Sample and Hold and Reset of the differentiator.

Output Q of the second flip-flop (pin 2) acts on pin 12 of IC14, blocking further STARTS by the pipette and on pin 5 of IC14, removing the Reset from the counters, IC33 and IC36.

Output Q (pin 1), still of the second flip flop, through the monostable IC11 supplies the PARALLEL LOAD to the counters, so that the data present on the parallel input (time in seconds) is acquired.

The incubation time thus appears on the Display and will start to decrease. When the Clock has discharged the counters, O.O will appear on the Display, while an end-of-count pulse will be present at output pin 7 of IC36.

This pulse is applied to the monostable IC12, which will operate the buzzer, and to IC11 (pin 5), the output of which will have the following functions:

1. Set the counters IC33 to IC36 on the UP count through binary IC16 (pin 14).
2. Reset binary IC16, the outputs of which (pins 1 and 2) will reset counters IC33 to IC36 and actuate IC14 (pins 11, 12, 13) to receive the analysis start pulse.

The start of analysis coming from PC 3 after operation of the automatic pipette will reach binary IC32 (pin 6), which will perform the following functions:

1. Inhibit IC14 (pins 1, 2, 3) from receiving further pulses from the TIMER START.
2. Remove the Reset from counters IC33 to IC36, which will start counting the analysis seconds.
3. Supply, through the monostable IC31 (pin 4) the switch to binary IC32, which should already be set by the TIMER START operation.

It should be remembered that this binary acts on Analog Card PC 6, applying the Sample and Hold pulse, resetting the differentiator and supplying a high level to the exponential threshold.

When the timer counters have counted the 5th second, IC14 (pins 8, 9, 10) will supply a pulse to binary IC32 (pin 11), which will allow sampling of Sample and Hold, actuation of the differentiator and the start of the exponential threshold which, as already stated, are located on Card PC 6.

The end of analysis, supplied by the Analog Card after formation of the clot, will be present on IC24 (pin 24), thereby switching binary IC22 (pin 10) to perform the following functions:

1. Block timer counting by supplying an O level at IC24 (pin 13).
2. Supply the switching pulse to monostable IC21, which will control PRINT of the printer-computer.

The Card also has two auxiliary circuits formed by IC23 (pins 8, 9, 10, 11, 12, 13), which sets the integrated circuits when the instrument is turned on.

10.8 PC 8 DISPLAY CIRCUITS

Refer to Schematic.

Because of its forward location this Card contains not only the Displays, but also the GO-STOP LEDs of the two channels and the temperature control LED. The GO and STOP actuation signals arrive independently for the two channels from Card PC 3.

A logic level 1 on the base of the transistors turns on the GO LEDs through resistances R4 (CHSX left) and R5 (CHDX right). In this case the voltage on the anode of the LEDs will be about 1 V and hence the STOP LEDs cannot start because of the two diodes in series CR3 and CR4 (left) and CR1 or CR2 (right), which determine their "ON" threshold at about 1.4 V. A logic (low) level 0 on the base of the transistors turns them "OFF", so that the GO LED will be off. The current through R4 and R5 will thus be able to pass through the diodes in series to the STOP LEDs and cause them to turn on.

With regard to the Display circuit, the data in BCD code on 4 Bits each come from the digital Cards.

The integrated circuits from IC21 to IC28 carry out the BCD decoding to 7 segments displays, allowing control of the display signals through limitation of current performed by the ARRAYS of resistances IC11 to IC18.

The logic OR and NAND circuits on each channel cause suppression of the non-significant zeros, so that:

0000.00 is 0.0

011.1 is 11.1

To do this the 4 input OR's record when the data relating to the most significant BITS are at level 0, supplying the decoders with the BLANK signals.

TABLE 10.2 DECODER BLANK SIGNALS

10	10	DY 10	DY 10
0	0	blank	blank
0	1-9	blank	on
1-9	0	on	on
1-9	1-9	on	on

PC 8.1 also has a circuit for the LAMP TEST, consisting of IC37 (pins 1, 2, 3) and IC33 (pins 1, 2, 3), which, on turning on the instrument, allows visualization of all "888.8" for a time determined by the time constant formed by R3 and C1.

11.0 CALIBRATION AND ALIGNMENT PROCEDURES

11.1 SYSTEM TEST EQUIPMENT

Nomenclature	Example Model #	Application	Range
Digital Voltmeter	Fluke MOD 8060A	Voltage Current Resistance	to 200 VAC (MAX) to 200 VDC (MAX) to 2A (MIN) to 300 Meg Ohm (MAX)
Oscilloscope	Tektronix MOD 465	Signal Analysis	Voltage 200V frequency to 20mHz response.
Thermometer	Reotemp MOD FV-1	Temperature	0-100°C $\pm$ 0.1°C Resolution

11.2 POWER SUPPLY

Card	Voltage	Tolerance Point	Ripple	Measure	Ground
PC 6	+12V analog -12V analog	$\pm$ 500 mV $\pm$ 500 mV	<5mV <5mV	TP2 TP3	TP1 TP1
PC 7	+12.5 digital + 5V digital	$\pm$ 500 mV $\pm$ 250 mV	<10mV <20mV	TP3 TP2	TP4 TP4

Power supply voltage are not adjustable, any difference in these values reflect component malfunction requiring service or replacement.

11.3 TEMPERATURE ADJUSTMENTS

1. All covers must be installed during temperature measurements.
2. Turn on the instrument and monitor temperature with a precision thermometer (0.1°C), allow adequate time for stabilization.
3. By means of trimmer P1 on PC 2, adjust temperature in the cuvette well to $37.2^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$. (Decrease temperature clockwise, increase temperature counter clockwise).
4. Check that; during the first heating phase (after turning on the instrument) the 37°C lamp located on the control panel is constantly ON, then starts to flash upon reaching the preset temperature.
5. Check that temperature swing is kept within $\pm 0.1^{\circ}\text{C}$.

11.4 PHOTO DIODE CARD PC 1

NOTE: Cuvette holder must be in place.

1. Darken the photo diodes by disconnecting the lamp connectors and covering the test well.
2. Connect the DVM to TP7 (ground TP1) of PC 6 for the left channel. Adjust P2 of PC 1 to obtain 0.000 on the DVM.
3. Connect the DVM to TP18 (ground TP1) of PC 6 for the right channel. Adjust P1 of PC 1 to obtain 0.000 on the DVM.
4. Reconnect the lamp connectors.

11.5 ANALOG CARD PC 6

After zeroing the photo diode, check lamp alignment and gain for each channel. Insure that the luminous image is perfectly vertical and centered on the photo diode. (See Figure 12.8.2).

1. Connect DVM to TP7 (ground TP1) of PC 6. The voltage must be 3.0 to 3.5 (for a new lamp), greater than 2.7 V for an old lamp. Readjust the telescope position and focus to obtain this value (see lamp installation Section 12.8).
2. Connect DVM to TP18 (ground TP1) of PC 6. The voltage must be 2.9 to 3.5 (for a new lamp) greater than 2.7 V for an old lamp. Readjust the telescope position and focus to obtain this value.
3. Connect the DVM to TP17 ground TP1. Press the RESET button of the right channel. Adjust P6 of PC 6 to obtain 0.000 V on DVM.
4. Connect the DVM to TP6 ground TP1. Press the RESET button of the left channel. Adjust P1 of PC 6 to obtain 0.000 V on DVM.
5. Connect the DVM to TP19 (ground TP1) of PC 6 adjust P7 of PC 6 to obtain 0.000 V on DVM.
6. Connect DVM to TP8 (ground TP1) of PC 6. Adjust P2 of PC 6 to obtain 0.000 V on DVM.
7. Connect DVM to TP20 (ground TP1) of PC 6. Adjust P9 of PC 6 to obtain -3.00 V on DVM.
8. Connect DVM to TP9 (ground TP1) of PC 6. Adjust P4 of PC 6 to obtain -3.00 V on DVM.
9. Connect the DVM to TP25 (ground TP1) of PC 6. Adjust P10 of PC 6 to obtain 0.000 V on DVM.
10. Connect DVM to TP14 (ground TP1) of PC 6. Adjust P5 of PC 6 to obtain 0.000 V on DVM.
11. Connect the DVM to TP21 (ground TP1) of PC 6. Start timer by pressing pipette button. For the first 5 seconds the Voltage will remain stable at 2.5 to 2.8V. After 5 seconds the voltage will decrease. After 80 seconds adjust P8 of PC 6 to obtain 200mV on DVM.
12. Connect DVM to TP10 (ground TP1) of PC 6. Start timer by pressing pipette button. For the first 5 seconds the voltage will remain stable at 2.5 to 2.8V. After 5 seconds the voltage will decrease. After 80 seconds adjust P3 to PC 6 to obtain 200mV on DVM.

11.6 FUNCTION CHECKS

1. When initially turning on the instrument, the following conditions must be obtained:
 - The display must make the LAMP TEST (888.8).
 - The 37°C lamp must be on without flashing.
 - The STOP lamps must be on.
 - The fan must expel air from the upper part of the instrument.
 - The agitators must rotate without any particular noise.
2. Ensure that when the preset temperature has been reached, the 37°C lamp flashes regularly.
3. Press the left RESET button and check that the GO lamp comes ON and the STOP lamp goes OFF. The left display will read 0.0. Press the pipette button and check that the count starts. The right GO lamp should come on and the right STOP lamp should go off. The right display will read 0.0. In the first 5 seconds, insert an opaque body into the left test well repeatedly and check that the instrument does not stop. Press pipette plunger. The right channel will start counting.
4. With the timer operating, check that the non-significant zeros are suppressed on the display.
5. Ensure that when the RESET button (left and right) are pressed, every digit on the display is blocked or zeroed.
6. After pressing the RESET button, press both TIMER START buttons and check that both STOP lamps light up and that the figure entered in minutes on the selectors is converted to seconds on the display. The count DOWN must start immediately. When the count has reached 0.0 the sound of a buzzer should be heard, independently for each channel, and the instrument should have one GO lamp on and one STOP lamp on.

NOTE: All the selector digits must be tested for conversion on the display.

7. Connect a DVM to the OUT (right - DX) BNC connector. Press the Pipette START button on the right side and, while inserting an opaque object into reaction chamber on the right side. Ensure that during the first 5 seconds the DVM reads OV and afterwards that there are DC voltage variations. Repeat procedure for the OUT left BNC Connector (left side). This checks Q1, Q4 and K1, K2 functions along with the recorder output circuits.

12.0 MAINTENANCE PROCEDURES

12.1 RECOMMENDED MAINTENANCE SCHEDULE

Table 12.1 Recommended maintenance.

Procedure	Operator or Service	Schedule
Lamp Replacement	Operator/Service	10 months
Stir Lube	Service	18 months
Pipette Wire	Service	12 months
Alignment	Service	12 months/lamp replacement.
Clean Optics	Operator	6 months or as required by spill.

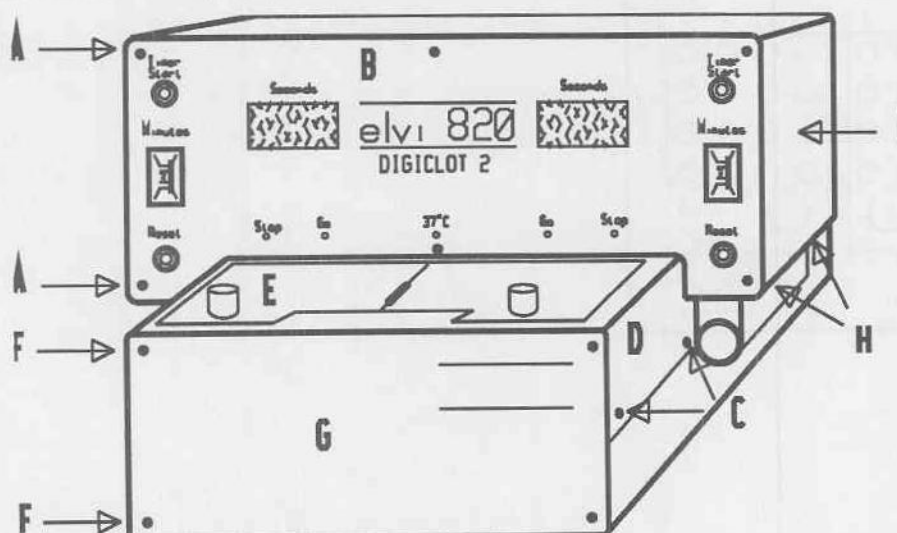
12.2 INSTRUMENT COVER REMOVAL

1. Turn the instrument's power switch "OFF" and remove both test chamber covers.
2. Remove the six screws (A) securing the Plexiglass face plate (B), then remove the plate.
3. Remove the four screws (C) located on the sides of the housing cover (D), lift up the front edge of the cover and pull out, ensuring that the cover clears the incubation block (E).
4. Remove the four screws (F) securing the front panel (G), then remove the panel.

NOTE: Plexiglass face plate must be removed before step 5 is attempted.

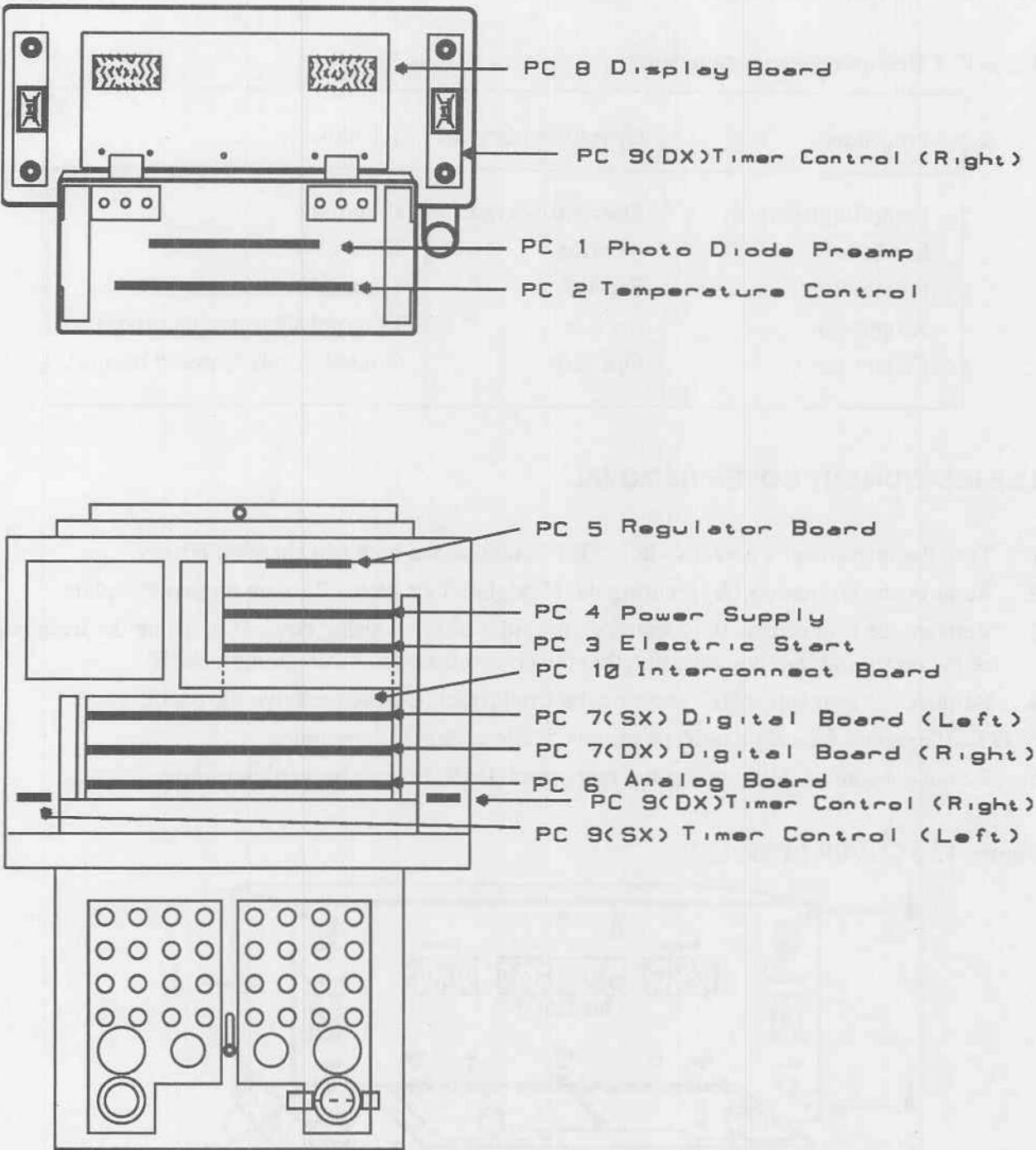
5. Remove 4 screws (H) securing top rear cover (I) slide cover forward to remove.

Figure 12.2 COVER REMOVAL



12.3 PC BOARD LOCATOR

Figure 12.3 PC BOARD LOCATION



12.4 ELECTRONIC TROUBLESHOOTING GUIDE

12.4.1 Instrument will not power up.

1. Check power cord connection to supply and instrument.
2. Check power source at outlet.
3. Check fuses.
4. Check connection block to transformer.

12.4.2 Instrument will not start when pipette is operated.

1. Check for proper installation of the pipette to instrument.
2. Check pipette sends start signal.
3. Check for open wire connection in cable from pipette to instrument. Check switch function.
4. Ensure all segment displays and drivers are functioning on PC 8. Turn off instrument after a brief wait turn on, all digits should show 8 for 2 to 3 seconds.
5. Check for timer start pulse at edge pin H, left, edge pin J, right PC 3.4.
6. Check for Pipette Start pulse at PC 7 IC14 pin 13.
7. Check for 10Hz Square Wave clock pulses to counters at TP1 12V PC 7 ICs 33, 34, 35 and 36.
8. Refer to pipette manual.

12.4.3 Instrument stops at sometime other than the expected time. This could involve shorter or longer times.

1. There are many potential operator or reagent problems that could cause this condition. Carefully review procedures, instrument instructions and package insert of the reagent system used. Ensure all instructions are followed.
2. A usual cause of failure is insufficient or no light. Check for the light beam in the test well by inserting an empty cuvette. Create a shadow for best results. If there is no light follow instructions in section 12.8 for replacement.
3. The light beam may be semi blocked. Use the Reset button to select the desired Test Well and start with the pipette. Allow 10 seconds to display, insert an empty cuvette into the Test Well. The Display timer should stop, repeat the test several times. If the timer stops proceed to section 6.2 cleaning optics, then section 11.5. If the timer does not stop proceed to PC 7 and look for a stop signal.

12.4.4 Incubation timer functioning improperly.

1. Check alignment of plexiglass display cover. The reset and timer start buttons must not bind against cover.
2. Remove display cover and top cover. See Section 12.2. Exchange position of the left and right PC 7. If problem changes from one channel to the other rule out PC 9 left or right. If it does not change check thumbwheel switch for proper code.
3. Check function of IC38 PC 7 for proper decoding of time to counters. This component is responsible for presetting counters for count down.
4. Check function of counters. PC 7.

12.4.5 Noise from instrument.

1. The 820 has only 2 systems with moving parts, the fan and the stir mechanism. Determine which system is malfunctioning.
2. If the noise is in the fan determine if the cause is a foreign object or the motor bearing. Clean or replace the fan.
3. If the noise is in the stir assemblies disassemble the mechanism and clean, lubricate and change brass shims and reassemble mechanism. See Section 12.9.

12.4.6 Temperature out of specifications.

1. Check for proper use of thermometer. For best results use a digital thermometer of low thermal mass. Insert thermometer in a centrally located well filled with .2 ml of water. Allow time to reach temperature.
2. Check power to heating element.
3. Check function of PC 2.

12.5 ANALOG TESTPOINT VALUES

Table 12.2 Normal Operating Analog Testpoint Values.

All values at reset are with empty test well. Test stopped using empty cuvette. All values are referenced to TP1 PC 6.

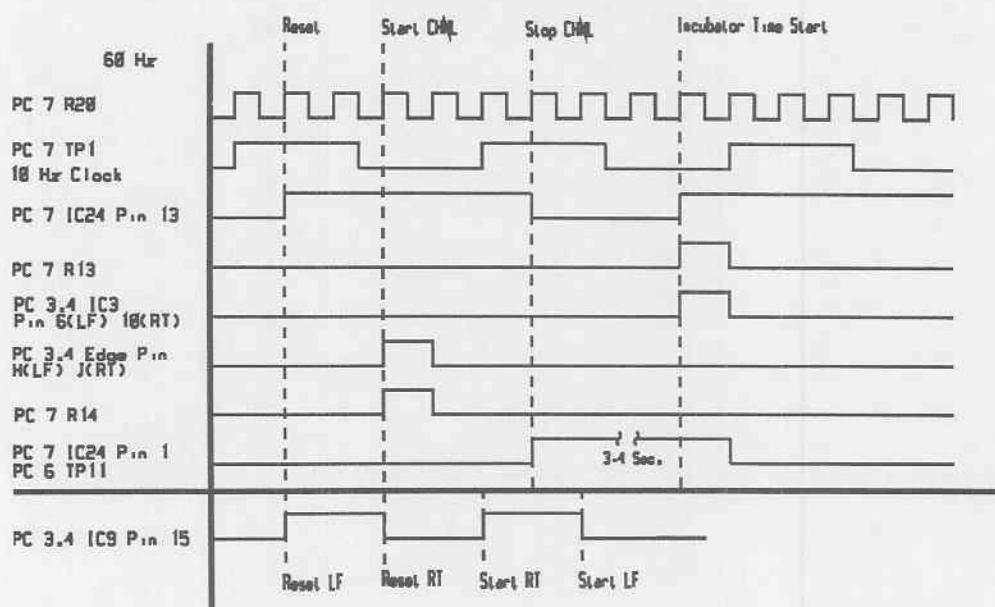
PC#	Left TP	Right TP	Function	Start	Stop	Comments
6	1		Ground			
6	2		+12 V			Supply
6	3		-12V			Supply
6	4	15	Light Signal	2.7-3.0	*2	Light Voltage
6	5	16	S&H Buffer	2.7-3.0		Will change after 5 seconds
6	6	17	Recorder		0.00	*2 *1
6	7	18	Low Pass Filter	2.7-3.0	*2	
6	8	19	Differentiator	0.0	11-12V	*1
6	9	20	Neg threshold	-3.00	-3.00	
6	10	21	Pos threshold	2.5-3.0	+200mV	@ 80sec
6	11	22	+OD STOP	.200	10V	Positive OD Change
6	12	23	-OD STOP	.200	10V	Negative OD Change
6	13	24	S&H Control	12.0	>1	End of first 5 seconds.

*1 Change reflects optical density change in cuvette.

*2 Change in voltage will occur, amount depends on object inserted in test well.

12.6 DIGITAL LOGIC TIMING WAVE FORMS

Figure 12.6 DIGITAL LOGIC TIMING WAVE FORMS



12.7 TEMPERATURE CONTROL TEST POINT VALUES**Table 12.3** PC 2 Normal Operating Values

TP#	Startup Value	Steady State	Comments
11	GND	GND	Ground
12	5.0 $\pm$.5V		5 volt power supply
10	12.0 $\pm$.6V		12 volt power supply
1	< 3V	3.1-3.2	Temp sensor input to comparator
3	3.1-3.2	3.1-3.2	Comparator threshold value adj. with P1 PC 2
2	LO GND (below temp)	Hi 12V (at temp)	Comparator output
4	Hi 12V	GND	Initial startup reset
5	12 V 7-75 KHz	same	Clock for IC7 pin 4&12
6	12 V 4Hz	same	Clock for Temp LED display
7	GND	12V 3 sec GND 1.5 sec	Modulation circuit for heater at near steady state conditions
8	30 VAC PP	Sine at 60Hz	Power for heater
9	GND	GND	Ground

See section 10.3, PC 2.1 Logic Diagram, and Schematic for further information.

12.8 ANALYZER LAMP REPLACEMENT PROCEDURE

This procedure is presented in two parts. The first part explains the replacement of the "TELESCOPE ASSEMBLY" as a pre-aligned unit. The second half details the procedure for replacement of the "LAMP ASSEMBLY" and alignment to complete the "TELESCOPE ASSEMBLY".

NOTE: Since there are two different types of screws (sheet metal and machine screws of various lengths) used on this instrument, it is recommended that you separate and record the location of the screws during disassembly.

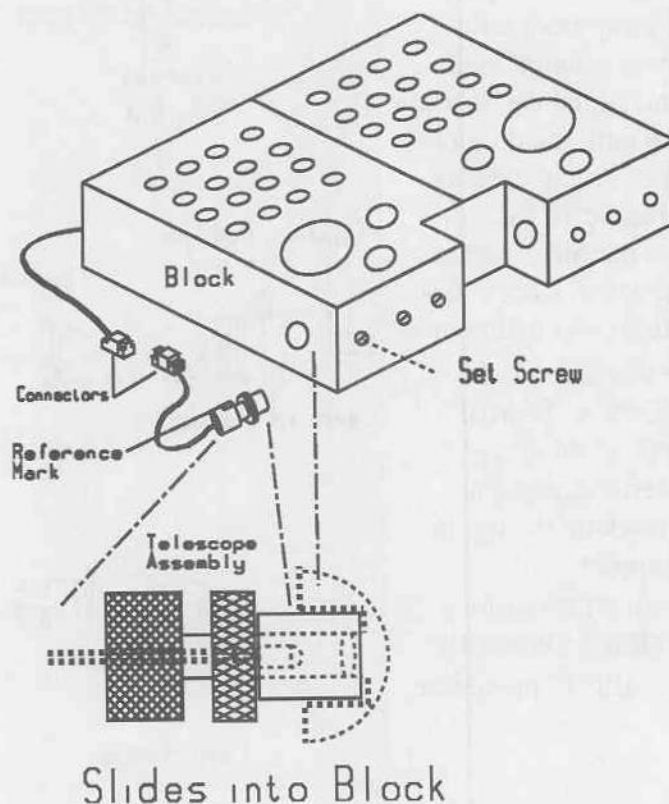
12.8.1 TELESCOPE ASSEMBLY REPLACEMENT

1. Turn the instrument's power switch "OFF" and remove both test chamber covers.
2. Remove instrument covers. See Section 12.2.
3. This procedure will only detail the left side. The right side is similar with appropriate opposite references.
4. Viewing the incubation block from a left angle, disconnect the lamp plug from the lamp connector.
5. Using a 1.5 mm allen wrench, loosen (Do NOT Remove) the set screw and slide out the telescope ASSEMBLY".

NOTE: During the following step, ensure that the reference mark is kept perpendicular to the base of the instrument.

6. Install the replacement ASSEMBLY and tighten the set screw.
7. Reassemble the instrument by reversing the disassembly procedure. Check that all connectors and screws are in their proper position.

Figure 12.8.1 TELESCOPE ASSEMBLY LOCATION



12.8.2 LAMP ASSEMBLY REPLACEMENT

1. Perform steps 1 to 5 of the "TELESCOPE ASSEMBLY REPLACEMENT" procedure.
2. Unscrew the internal ring nut from the lamp support and remove the lamp assembly.
3. Using an allen wrench, loosen the lamp collar and slide it and the internal ring nut off of the lamp. Reassembly the lamp collar and internal ring nut on a new lamp.

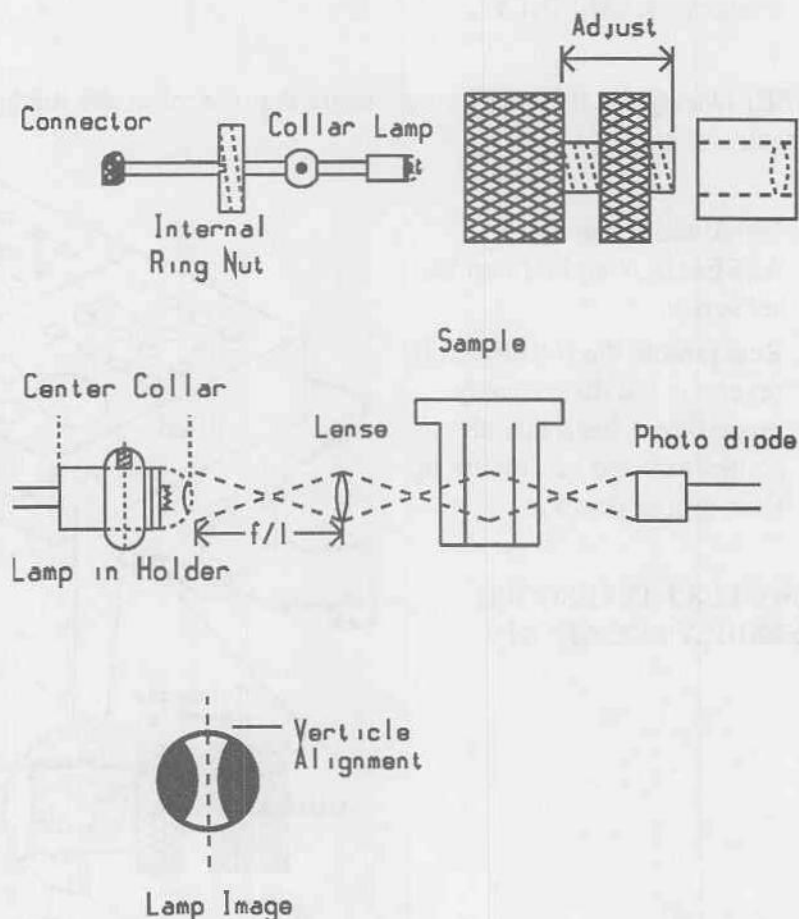
NOTE: The lamp collar must be centered between the lamp base and tip of the lamp lens for maximum flexibility during the "TELESCOPE ASSEMBLY ALIGNMENT" procedure.

4. Insert the lamp and collar back into the lamp support and loosely secure the internal ring nut.
5. Re-connect the lamp plug to the lamp connector, then turn the power switch "ON".
6. Secure the telescope to the lamp support with the external ring nut. **TELESCOPE ADJUSTMENT** needs to be performed with a DVM to adjust for maximum reading from the photo diode - Amps. (PINs A or B -D) 3.1 - 3.7 (300 Mv Maximum difference between channels. Use TP4 for left, TP15 for right lamp amplitude peaking adjustment. TP1 will be common Ground. These Test Points are located on PC 6, Analog Board. See Figure 12.3 for Location.

Figure 12.8.2 TELESCOPE ASSEMBLY ALIGNMENT

IMAGE ADJUSTMENT

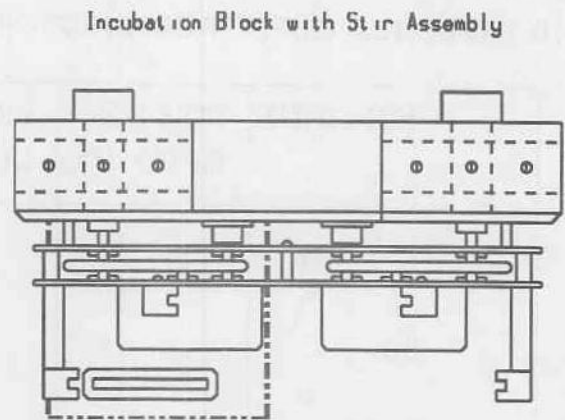
7. Holding the face of the telescope approximately 2.5 cm (1 in.) away from a flat surface, loosen the internal ring nut and adjust the position of the lamp until the projected image has a vertical axis, as shown in Figure 12.8.2. Tighten the internal ring nut locking the lamp. Check to see that the image was maintained.
8. Rotate the whole "TELESCOPE ASSEMBLY" until the axis of the image is perfectly vertical, make a reference mark on the top of the lamp support.
9. Proceed with STEP 6 of the "TELESCOPE ASSEMBLY REPLACEMENT" procedure.



12.9 STIR MECHANISM LUBRICATION

Figure 12.9.1 STIR MECHANISM

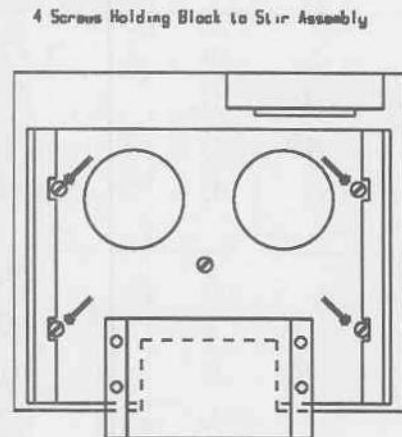
1. Turn off instrument and remove power cord.
2. Remove covers from instrument. See Section 12.2.
3. Remove plug from photo diode preamp card PC 1.
4. Remove PC 2 by removing retainer.
5. Remove 4 screws holding incubation block in place. 2 on each side.



Incubation Block with Stir Assembly

Figure 12.9.2 STIR MECHANISM

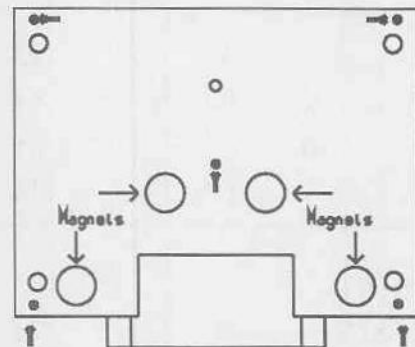
6. Remove ground wire from incubation block.
7. Remove block assembly and place it upside down on work bench. See Figure 12.9.1.
8. Remove 4 screws holding stir assembly to incubation block (there should be notches in orange plastic PC 2 holders). See Figure 12.9.2.
9. Remove stir assembly from block, place on counter magnet side up.



4 Screws Holding Block to Stir Assembly

Figure 12.9.3 STIR MECHANISM

10. Remove magnets using 1.5mm hex wrench to loosen retainer, gently, but firmly, remove magnets. Sometimes they are very stubborn, don't bend the shaft. See Figure 12.9.3.
11. Remove 5 screws holding 2 plates of stir assembly together. See Figure 12.9.3.
12. Remove top plate exposing pulleys and drive belt. See Figure 12.9.4
13. Clean all parts and check for damage to bearing surfaces.

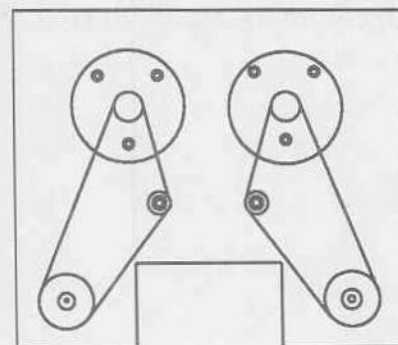


5 Screws Holding Stir Assembly Together

Stir Assembly Pulleys

Figure 12.9.4 STIR MECHANISM

14. All lower brass shims should be replaced. Reuse upper shims if in good condition.
15. Check motor screws for tightness and inspect drive belts.
16. Lubricate all bearing surfaces and brass shims with high quality grease.
17. Reassemble components in the reverse order listed above.



12.10 TABLE 12.4 OUTPUT CONNECTOR FOR QUICK COMPUTER

FUNCTION		PINS FOR RT CH (DX)	PINS FOR LT CH (SX)	NOTES
-1 10	A	21	8	
	B	20	7	
	C	19	6	
	D	18	5	
0 10	A	17	4	
	B	16	3	
	C	15	2	
	D	14	1	
1 10	A	39	26	
	B	40	27	
	C	41	28	
	D	42	29	
2 10	A	43	30	
	B	44	31	
	C	45	32	
	D	46	33	
PRINT		22	9	_ _ = 6ms _ _ _ _ = 200ms
RESET		23	10	
GROUND		25	12	

NOTE: All output signals are TTL compatible - Active Level "1" (5V).

12.11 ELVI 820 ELECTRIC PIPETTE

The pipettor is designed to deliver 0.1 and 0.2 ml volumes, and when fully depressed, automatically start the timer on the Elvi 820.

The pipettor operates as a "to deliver" device in which the movement of the plunger displaces air. The tip is made of non-wettable plastic. The longer expel stroke "blows out" the fluid.

As you depress the plunger, feel for the first stop. This is the primary or calibrated stop. Exert additional pressure to move the plunger knob to its lowest position. This travel beyond the calibrated stop is the expel stroke and activates the timer.

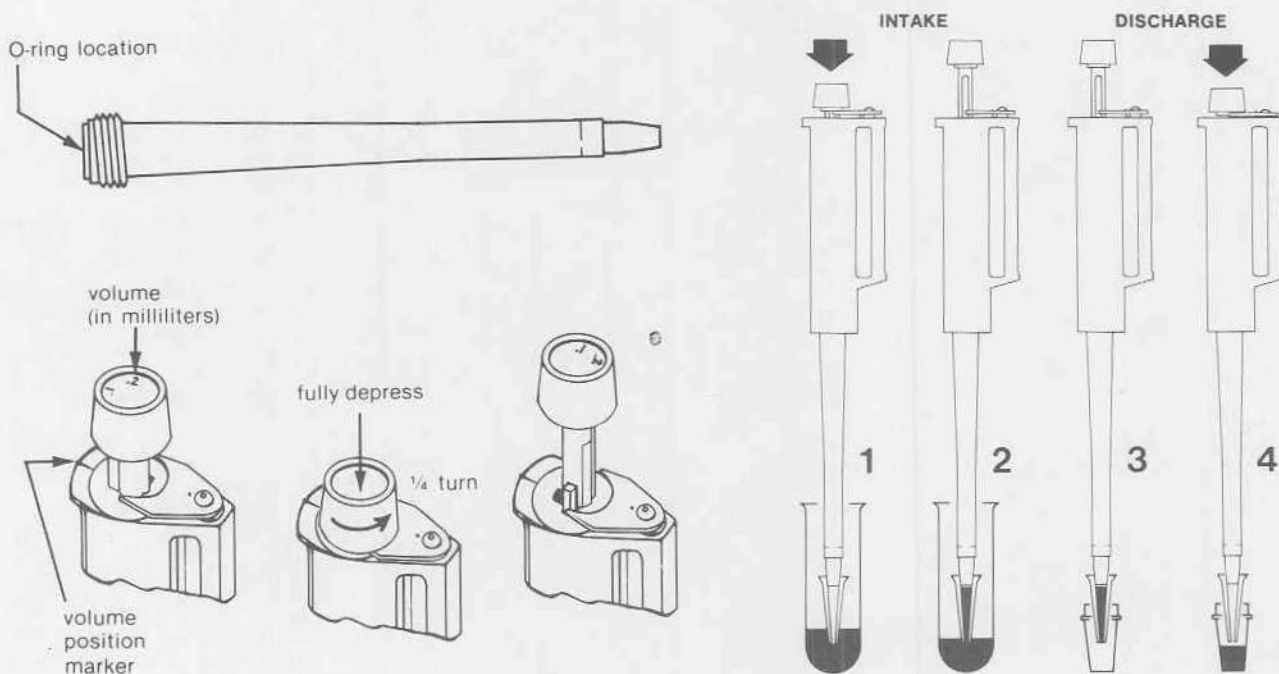
The Pipettor has two calibrated volumes - 0.1 and 0.2 ml. Change volumes by depressing the plunger and rotating to the selected volume.

Cleaning and Maintenance

A maintenance kit is available which contains new O-rings, a cleaning wire and a tube of lubricant.

Clean the pipette whenever the plunger feels sluggish. Clean the cylinder wall, O-ring seat and the piston. Replace the O-ring as needed. Lubricate by applying a small amount of lubricant to the piston and O-ring.

Figure 12.10 PIPETTE OPERATION



This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

13.0 PARTS LISTS

These parts lists reflect all circuit modifications and refinements. If your parts differ, please inquire about using the ones listed here.

The following sections list the abbreviations and references designator used in this list and schematics.

13.0.1 CIRCUIT REFERENCES (CKT REF)

B - Motor	LP - Incandescent Lamp
C - Capacitor	P - Potentiometer
CR - Rectifier Diode	PC - Printed Circuit Board
DS - Buzzer, LED	Q - Transistor
DY - Display	R - Resistor
DZ - Zener Diode	RT - Thermistor
F - Fuse	SRC - Triac
FL - Filter	SW - Switch
FR - Photo resistor	TB - Terminal Block
FWR(D) - Full Wave Rectifier	TR - Transformer
H - Wiring Harness	V - Photo Diode
IC - Integrated Circuit	VR - Voltage Regulator, Zener Diode
J - Female Connector	X - Socket
K - Relay	

13.0.2 MANUFACTURER CODE ABBREVIATIONS AND PREFIXES (MFG P/N)

OEM - Original Equipment Manufacturer	P/N - Part Number
OBS - Obsolete	

USA:

AB - Allen - Bradley Co.	LF - Littelfuse Inc.
AP - Amphenol Products	LM - National Semiconductor Corp.
BI - Beckman Industrial Corp.	MV - Monsanto
CA - RCA	MX - Molex Inc.
CK - C & K Components Inc.	PM - Pamotor / WM. J. Purdy Co.
CM - Chicago Miniature Works	SN - Texas Instruments Inc.
EC - Elco Corp	TIP - Texas Instruments Inc.
FSN - T & B / Ansley Corp.	S - Spectrol / Elexs Corp.
F - Fairchild	

Europe:

BPW - Telefunken Electronics

F - Connei

FN - Schaffner EMC, Inc.

TFK - Telefunken Electronics

MB - Contraves / AG

13.0.3 DESCRIPTIONS

AWG - American Wire Gauge

BCD - Binary Coded Decimal

BNC - Baby "N" Connector

CMOS - Complementary Metal Oxide Semiconductor

Crbn - Carbon Composition

Crmc - Ceramic

DIN - Deutsche Industrie Normenausschuss

DIP - Dual In-Line Package

Coml. - Commercially available

DPDT - Double Pole, Double Throw

Elect. - Electrolytic

FET - Field Effect Transistor

Poly. - Polyester

LED - Light Emitting Diode

OpAmp - Operational Amplifier

OD - Optical Density

TTL - Transistor - Transistor Logic

Tant - Tantalum

13.0.4 USE-ON CODES (UOC)

Serial Number:	Modification:	Boards:
1 to 127	Magnetic Pipette	PC 3.0
128 to 300	Electric Pipette	PC 3.1
301 to 330	Electric Pipette	PC 3.2
1300 to Present	Auto Reset	PC 3.4
1 to 330	Electric Pipette	PC 10.0
1300 to Present	Auto Reset	PC 10.1

13.1 DESCRIPTIONS OF MAJOR ASSEMBLIES

Table 13.1 Physical Description of Major Assemblies

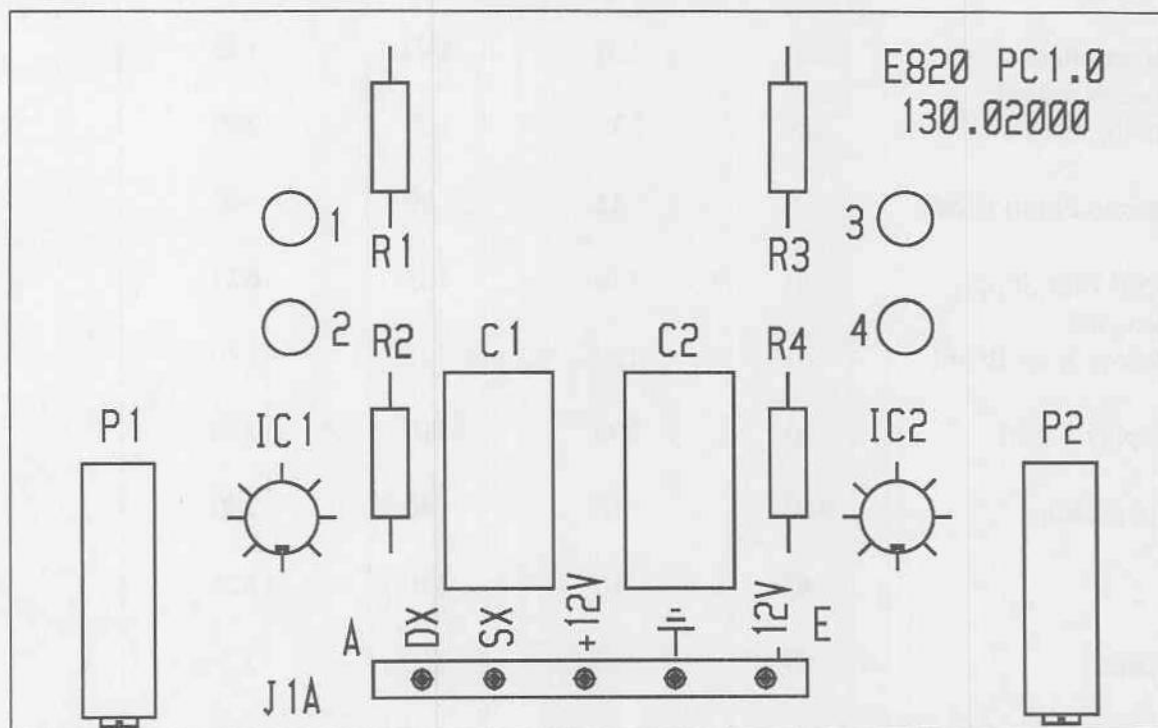
Assembly	L (mm)	W (mm)	H (mm)	W (g)*
Top Cover Rear	272	360	185	1.75 Kg
Top Cover Front	322	272	60	450
Front Cover	4	263	115	250
Rear Cover	353	5	134	250
Display Cover Plexiglass	353	2	133	81
INCUBATION BLOCK with: Stir Assembly	160	185	90	2.95 Kg
PC 7 Digital Board	20	235	166	207
PC 2 Temperature Control Board	25	150	140	130
PC 6 Analog Board	25	235	165	280
PC 1 Preamp Photo Diode	25	82	50	40
PC 4 & 5 Power Supply Heatsink	70	130	135	627
PC 3 Electric Start Board	20	130	135	70
PC 8 Display Board	20	200	110	250
Pipette in packing	310	70	60	240
Fan	40	120	120	525
Transformer	90	110	110	2.8 Kg
Box of 1000 tips				850
Box of 1000 cuvettes				1.4 Kg

* Weight in grams unless otherwise noted.

13.2 E820 PC 1 PHOTO DIODE PREAMP

REF.	CATALOG #	P/N	DESCRIPTION
PC 1.0	661.02000	OEM	PC 1 - Complete Board
PC 1.0	130.02000	OEM	PC 1 - Bare Board
IC1, IC2	010.02042	LH0042CH	IC-FET Op-Amp Internally Compensated, 8 lead, MCP
C1, C2	045.63104	Coml.	Cap. Poly. 0.1 μ F 160V, Radial Leads
P1, P2	022.11103	BI-89PR103	P, Trimmer 10K 20 turn, .75w Spectrol 43P 103 10K
R1, R3	030.13124	Coml.	Resistor 120K ohm, 1/4w 5%
R2, R4	030.13123	Coml.	Resistor 12K ohm, 1/4w 5%
J1A	114.31053		Connector Male, 5 pin
	205.10000		Retainer Strip
	101.26010		Screw, Selftap, Phillips

Figure 13.1 ELVI 820 PC 1 PHOTO DIODE PREAMP



DX=Right

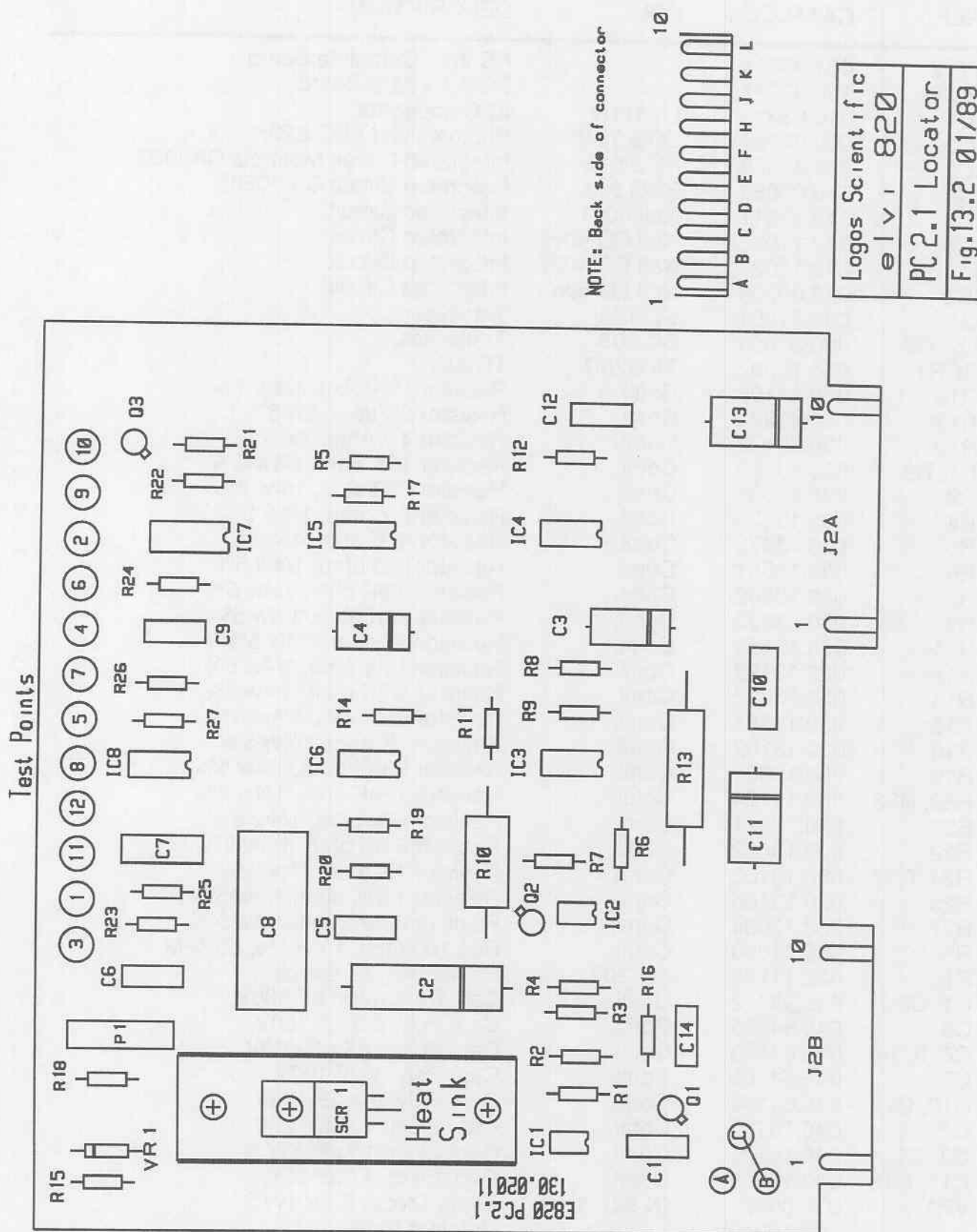
SX=Left

Logos Scientific
elvi 820
PC 1.0 Locator
Fig. 13.1 01/89

13.3 E820 PC 2 TEMPERATURE CONTROL BOARD

REF.	CATALOG #	P/N	DESCRIPTION
PC 2	661.02011		PC 2.1 - Complete Board
PC 2	130.02011		PC 2.1 - Bare Board
IC1	010.03311	LM311N	IC Comparator
IC2	050.00004	ECG 3040	Photoresistor FDC 820;
IC3	010.00059	ECG 914	Integrated Circuit Motorola CA3059
IC4	010.00086	ECG 912	Integrated Circuit CA 3086,
IC5	012.11011	Natl 4011	Integrated Circuit
IC6	012.11093	Natl CD 4093	Integrated Circuit
IC7	012.11027	Natl CD 4027	Integrated Circuit
IC8	010.00556	Natl LM 556	Integrated Circuit
Q1	080.31001	BC 178	Transistor,
Q2, Q3	080.31003	BC 108	Transistor,
SCR1	084.10007	TIC226D	TRIAC,
R16	030.11103	Coml.	Resistor 10K ohm, 1/4w 1%
R13	030.43222	Coml.	Resistor 2K ohm, 2w 5%
R10	030.33472	Coml.	Resistor 4.7 ohm, 1w 5%
R1, R8	030.13103	Coml.	Resistor 10K ohm, 1/4w 5%
R2	030.13331	Coml.	Resistor 330 ohm, 1/4w 5%
R4	030.13472	Coml.	Resistor 4.7 ohm, 1/4w 5%
R5	030.13473	Coml.	Resistor 47K ohm, 1/4w 5%
R6	030.13561	Coml.	Resistor 560 ohm, 1/4w 5%
R7	030.13562	Coml.	Resistor 5.6K ohm, 1/4w 5%
R9	030.13333	Coml.	Resistor 33K ohm, 1/4w 5%
R11	030.13470	Coml.	Resistor 47 ohm, 1/4w 5%
R12	030.13122	Coml.	Resistor 1.2K ohm, 1/4w 5%
R14	030.13822	Coml.	Resistor 8.2K ohm, 1/4w 5%
R15	030.13681	Coml.	Resistor 680 ohm, 1/4w 5%
R18	030.13102	Coml.	Resistor 1K ohm, 1/4w 5%
R19	030.13334	Coml.	Resistor 330K ohm, 1/4w 5%
R20, R23	030.13124	Coml.	Resistor 120K ohm, 1/4w 5%
R21	030.13471	Coml.	Resistor 470 ohm, 1/4w 5%
R22	030.13682	Coml.	Resistor 6.8K ohm, 1/4w 5%
R24, R17	030.13102	Coml.	Resistor 1K ohm, 1/4w 5%
R25	030.13105	Coml.	Resistor 140K ohm, 1/4w 5%
R27	030.13684	Coml.	Resistor 680K ohm, 1/4w 5%
R3	036.41000	Coml.	Res 100 ohm, 1/4w 1%, 50PPM
P1	022.11202	43P202	P. Trimmer 2K Spectrol
C1, C5	045.93472	Coml.	Cap. Poly. 4700 pF 630V
C8	045.54335	Coml.	Cap. Poly. 3.3 μ F 100V
C6, 9, 14	045.83103	Coml.	Cap. Poly. 10K pF 400V
C7	045.54105	Coml.	Cap. Poly. 1 μ F 100V
C10, C12	045.63104	Coml.	Cap. Poly. 0.1 μ F 160V
C2	040.16107	Coml.	Cap. Elect. 100 μ F 25V
C3, C4	040.16106	Coml.	Cap. Elect. 10 μ F 25V
C11, C13	040.16476	Coml.	Cap. Elect. 47 μ F 25V
VR1	010.09821	IN 821 A	Zener Diode, 5.1V 1W
	205.10010		Retainer Strip
	101.26010		Screw, Selftap, Phillips 10mm

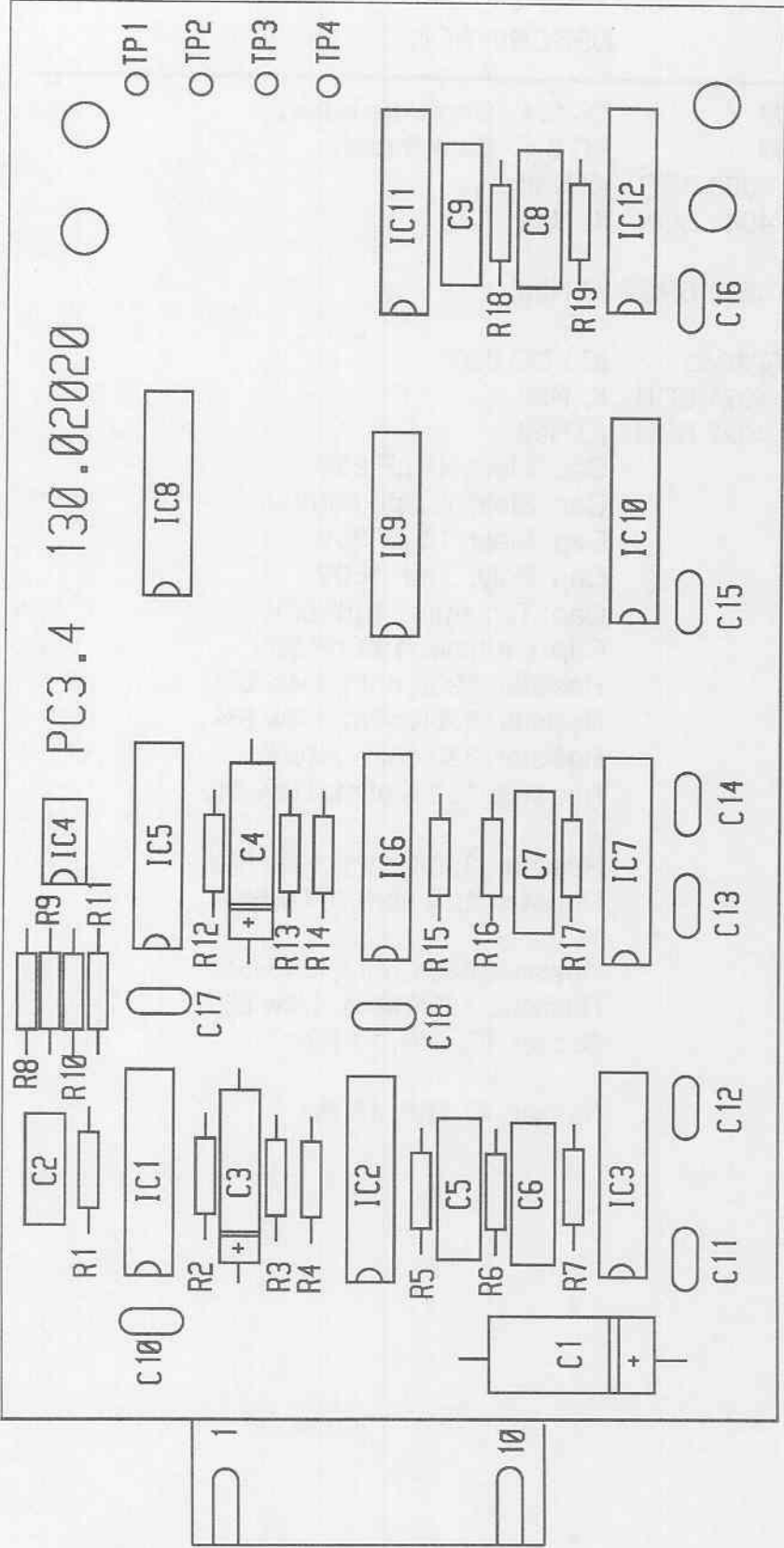
Figure 13.2 ELVI 820 PC 2 TEMPERATURE CONTROL BOARD



13.4 E820 PC 3 ELECTRIC START BOARD

REF.	CATALOG #	P/N	DESCRIPTION
PC 3	661.02024	OEM	PC 3.4 - Complete Board
PC 3	130.02024	OEM	PC 3.4 - Bare Board
IC1	012.11093	CD 4093 BDC	IC Natl.
IC2, 10 11	012.11081	CD 4081 BCN	IC Natl.
IC3, 7 12	012.31028	CD 4528 BPC	IC Natl.
IC4	050.00004	ECG 3040	IC FDC 820
IC5, 6, 8	012.11071	CD 4071 BCN	IC Natl.
IC9	012.11027	CD 4027 BCN	IC Natl.
C1	040.16476		Cap. Elect. 47 μ F 25V
C2	045.94472		Cap. Elect. 4.7 pF 630V
C3, 4	040.16106		Cap. Elect. 10 μ F 25V
C5 - C9	045.63104		Cap. Poly. .1 μ F 160V
C10 - C16	044.16104		Cap. Tantalum, .1 μ F 50V
C17, 18	044.16103		Cap. Ceramic, 10K pF 50V
R1	030.13124		Resistor, 120K ohm, 1/4w 5%
R2	030.13334		Resistor, 330K ohm, 1/4w 5%
R3	030.13331		Resistor, 330 ohm, 1/4w 5%
R4, 5, 8, 9, 10, 12, 14, 16	030.13104		Resistor, 100 K ohm, 1/4w 5%
R6, 7	030.13394		Resistor, 390K ohm, 1/4w 5%
R11, 13 15	030.13103		Resistor, 10K ohm, 1/4w 5%
R17	030.13684		Resistor, 680K ohm, 1/4w 5%
R18, 19	030.13184		Resistor, 180K ohm, 1/4w 5%
XIC1, 2, 5, 6, 8, 10, 11	120.11421		Socket, IC, DIP, 14 Pin
XIC3, 7, 12	120.11621		Socket, IC, DIP, 16 Pin

Figure 13.3 ELVI 820 PC 3.4 ELECTRIC START BOARD



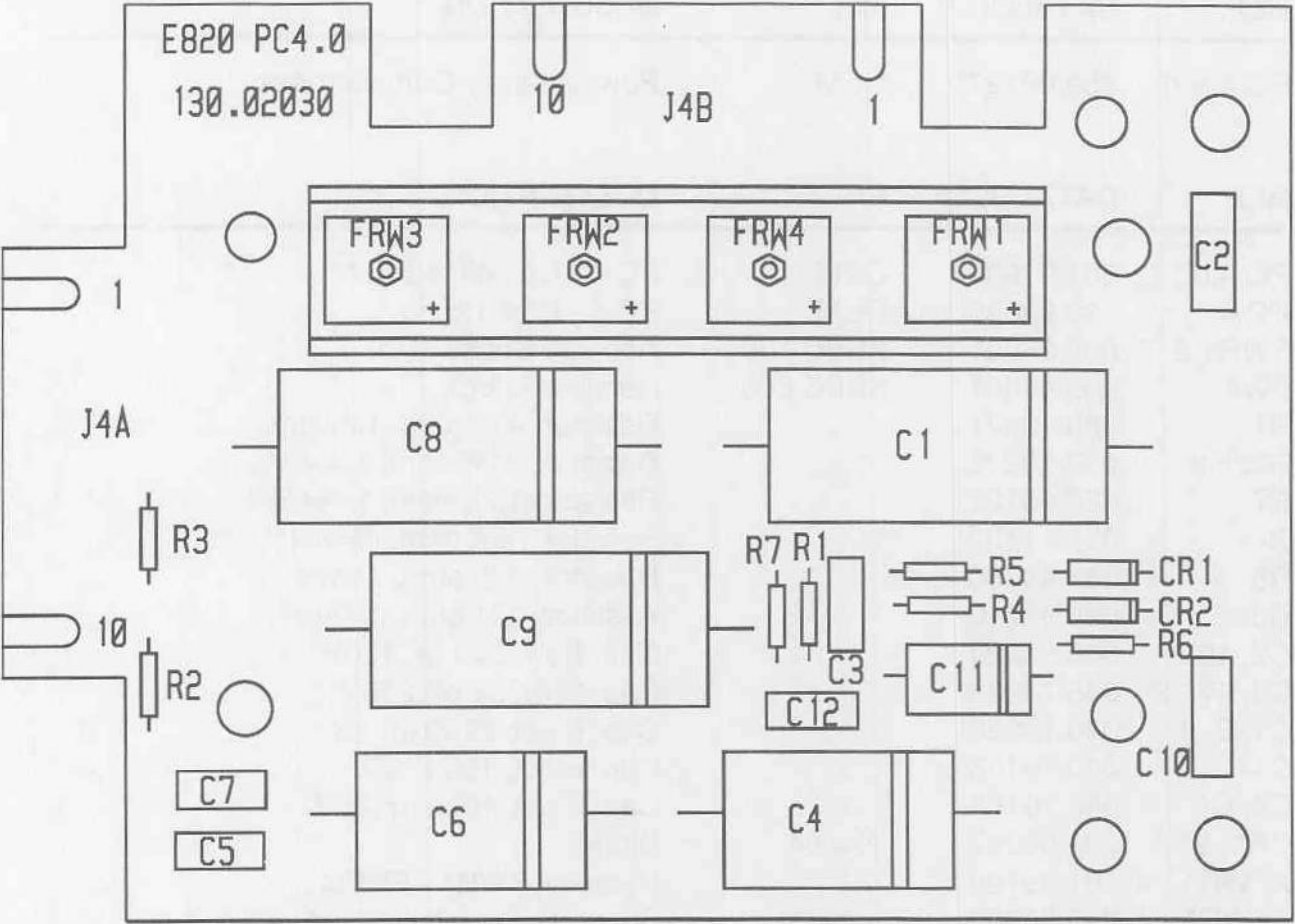
13.5 ELVI 820 PC4 - PC5 - POWER SUPPLY BOARD

REF.	CATALOG #	P/N	DESCRIPTION
PC 4 & 5	659.00127	OEM	Power Supply Complete Assy

REF.	CATALOG #	P/N	DESCRIPTION
PC 4.0	661.02030	OEM	PC 4 - Complete Board
PC 4	130.02030	OEM	PC 4 - Bare Board
FWR1,2, 3	005.26001	KBPC 106	Rectifier Bridge
FW4	005.46001	KBPC 606	Rectifier Bridge
R1	030.13471		Resistor, 470 ohm, 1/4w 5%
R2, R3	030.13222		Resistor, 2.2K ohm, 1/4w 5%
R7	030.13122		Resistor, 1.2K ohm, 1/4w 5%
R4	030.11152		Resistor 1.5K ohm, 1/4w 1%
R5	036.44750		Resistor, 475 ohm, 1/4w 1%
R6	036.42210		Resistor, 221 ohm, 1/4w 1%
C2, 10	045.54224		Cap. Poly. 220 pF 100V
C3,5,7,12	045.74223		Cap. Poly. 22 pF 250V
C1, 8, 9	040.16228		Cap. Elect, 2200 μ F 25V
C11	040.16106		Cap. Elect, 10 μ F 25V
C4, C6	040.16108		Cap. Elect, 1000 μ F 25V
CR1, 2	001.00007	IN4004	Diode
XFWR1 - 4	601.90100		Heatsink FWR1 - FWR4
XFWR1 - 4	330.80089		Spacers, Heatsink FWR1 - FWR4

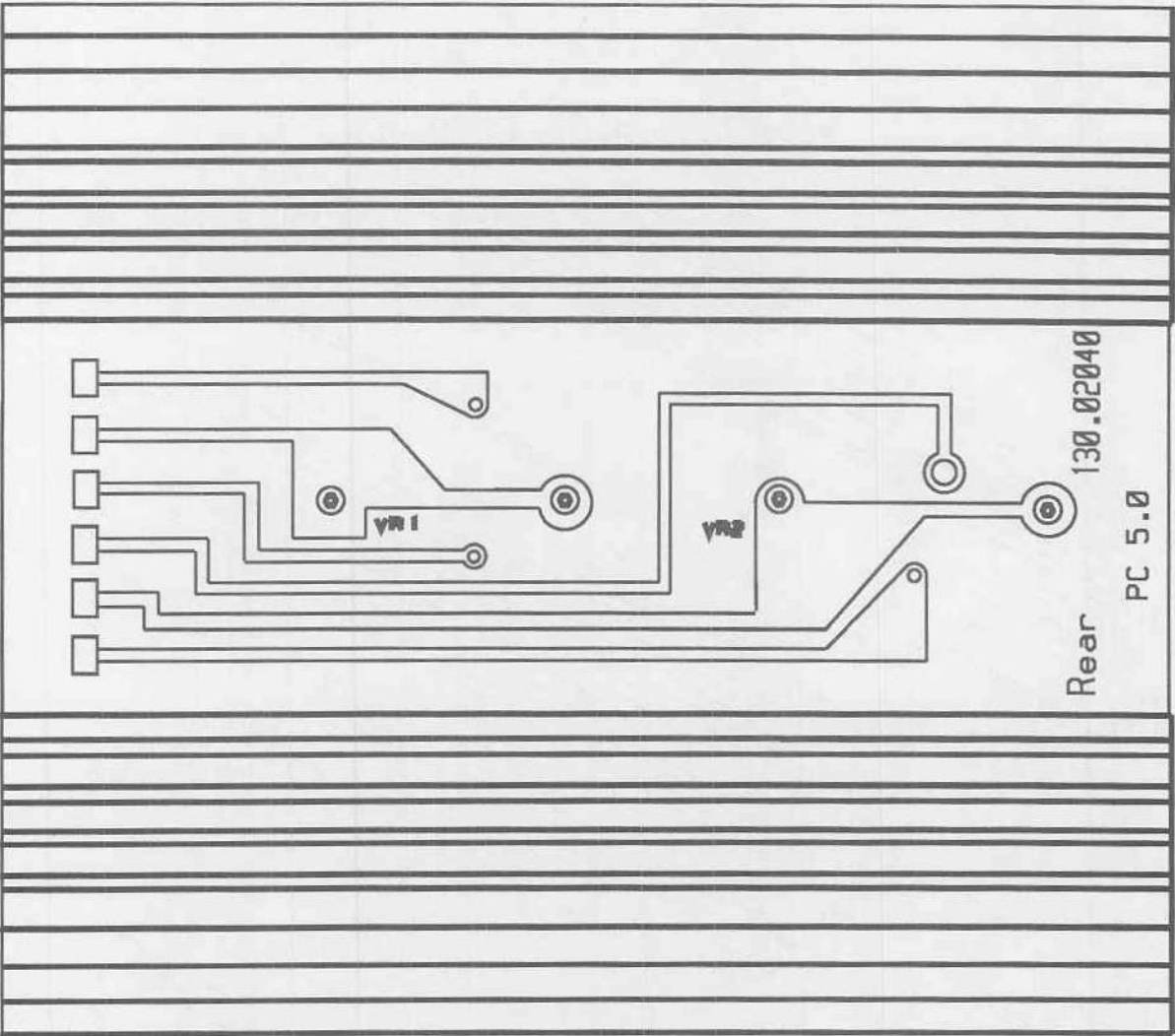
REF.	CATALOG #	P/N	DESCRIPTION
PC 5	661.02040		PC 5 - Complete Board
PC 5	130.02040		PC 5 - Bare Board
VR1	013.40541	LM 340 K-5	Integrated Circuit Natl
VR2	013.40241	LM 317 K	Integrated Circuit Natl
	149.64120		Jumper 12 x 2" Ribbon Cable
	552.16001		Insulated Bushings
	329.04032		Heatsink
	552.15002		Mica Insulator
	502.45101		Screw, PC Retainer, Flat Machine

Figure 13.4 ELVI 820 PC 4 POWER SUPPLY BOARD



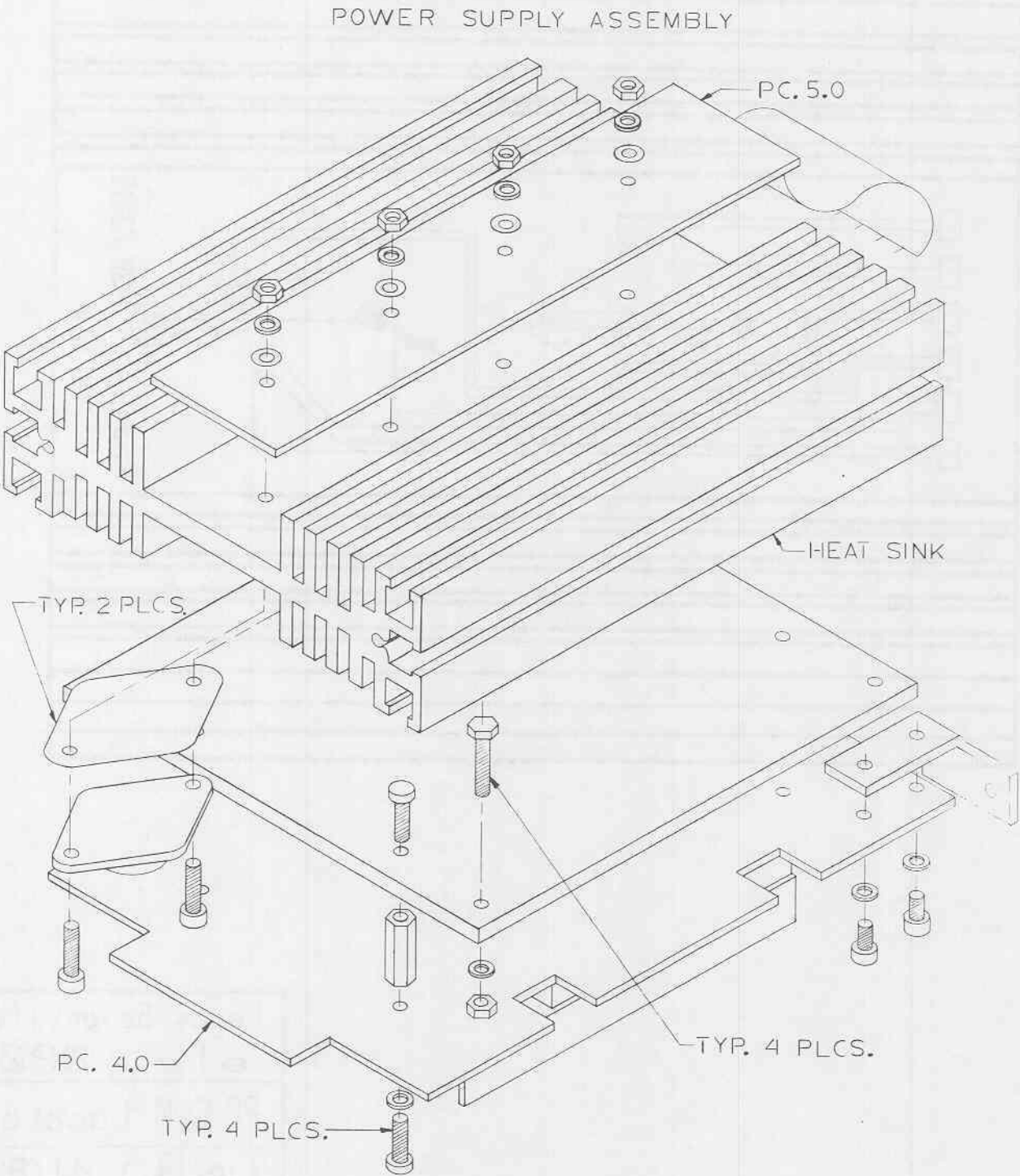
Logos Scientific
elvi 820
PC 4.0 Locator
Fig.13.4 01/89

Figure 13.5 ELVI 820 PC 5 POWER SUPPLY BOARD



Logos Scientific
elvi 820
PC 5.0 Locator
Fig.13.5 01/89

Figure 13.5.1 ELVI 820 POWER SUPPLY ASSEMBLY



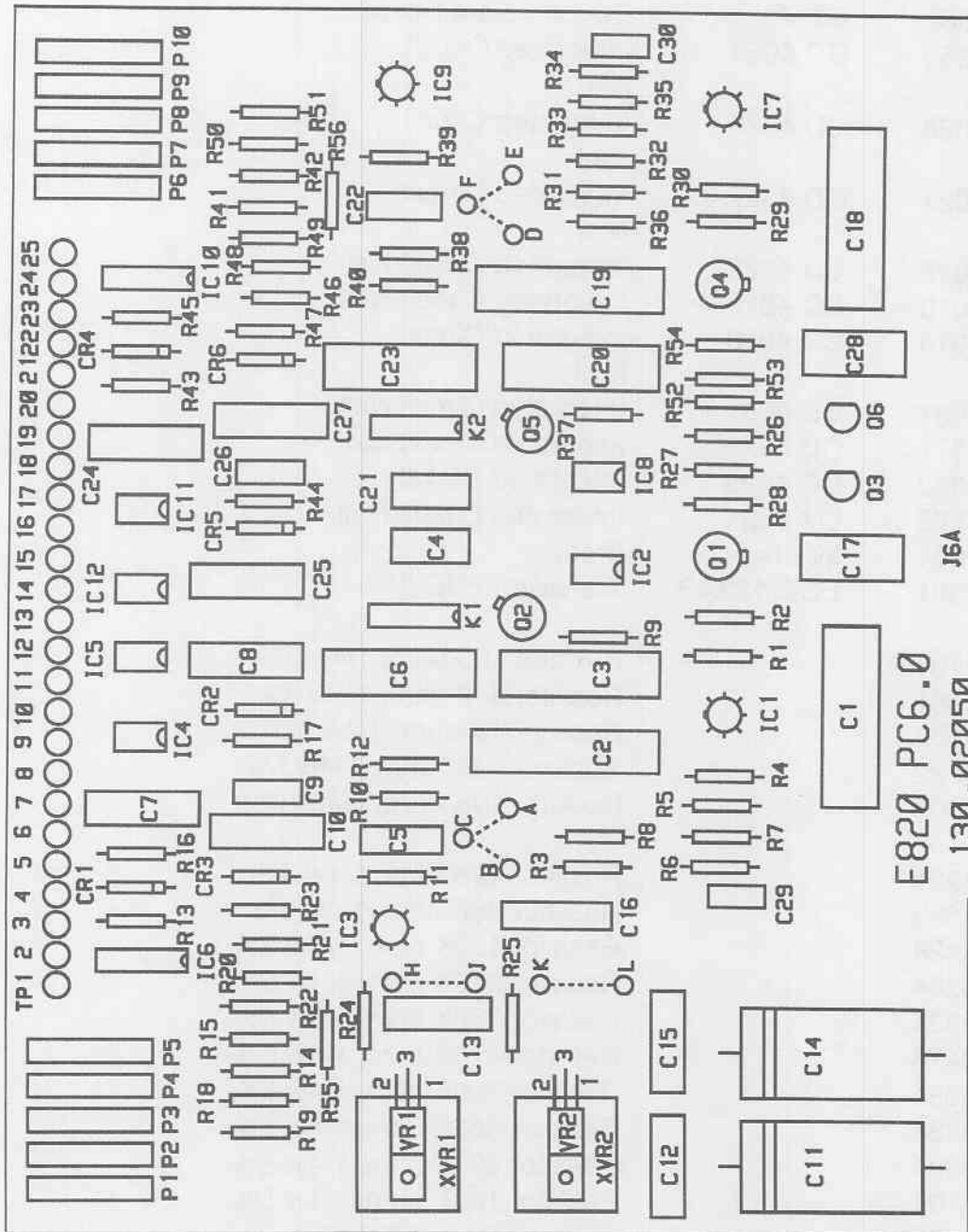
13.6 ELVI 820 PC 6 ANALOG BOARD

REF.	CATALOG #	P/N	DESCRIPTION
PC 6.0	661.02050		PC 6.0 - Complete Board
PC 6.0	130.02050	OEM	PC 6.0 - Bare Board
VR1	013.21231	LM 340 T	Integrated Circuit Natl +12V
VR2	013.21232	LM 320 T	Integrated Circuit Natl -12V
IC1, 3, 7, 9	010.02042	LH 0042 CH	Integrated Circuit Natl
IC2, 8	010.03358	LM 358N	Integrated Circuit Natl
IC4, 5, 11, 12	010.03311	LM 311 N	Integrated Circuit Natl
IC6, 10	010.00348	LM 348 N	Integrated Circuit Natl
Q1, Q4	010.21001	3N163	Transistor, Mos, Fet,
Q3, Q6	080.12003	2N5401	Transistor, BC 320
Q2, Q5	080.31003	BC 108	Transistor
CR1, 2, 4 5	001.10001	IN914	Diode
CR3, CR6	001.00007	IN4004	Diode
P1, 2, 4 6, 7, 9	022.11103	89XR10K	P. Trimmer, 10K ohm, Beckman or Spectrol 43P 103 10K
P3, P8	022.11102	43P 102 1K	P. Trimmer, 1K ohm, Spectrol
P5, P10	022.11503	89PR50K	P. Trimmer, 50K ohm, Helitriton
C11, C14	040.16108		Cap. Elect, 1000 μ F 25V
C12, C15	045.54334		Cap. Poly. 0.33 μ F 100V
C17, C28	045.54684		Cap. Poly. 0.68 μ F 100V
C3, C20	045.54225		Cap. Poly. 2.2 μ F 100V
C1, C18	045.54685		Cap. Poly. 6.8 μ F 100V
C2, C19	045.54475		Cap. Poly. 4.7 μ F 100V
C10, C27	045.54105		Cap. Poly. 1 μ F 100V
C6, C23	045.54335		Cap. Poly. 3.3 μ F 100V
C4, C21	045.64104		Cap. Poly. 0.1 μ F 160V
C5, C22	045.74473		Cap. Poly. 0.047 μ F 250V
C7, C8	045.54474		Cap. Poly. 0.47 μ F 100V
C24, C25			
C13, C16	043.35106		Cap. Elect, 10 μ F 20V
C9, C26	045.75683		Cap. Poly. 0.068 μ F 250V
C29, C30	045.74223		Cap. Poly. 0.022 μ F 250V
R1, 3, 4 9, 14, 29, 31, 32	030.13103		Resistor 10K ohm, 1/4w 5%
R16, 23, 27, 45, 47, 53	030.13123		Resistor 12K ohm, 1/4w 5%
R19, 28 51, 54	030.13222		Resistor 2.2K ohm, 1/4w 5%

13.6 ELVI 820 PC 6 ANALOG BOARD - Continued

REF.	CATALOG #	P/N	DESCRIPTION
R2, 13, 17, 30, 43, 44	030.13182		Resistor 1.8K ohm, 1/4w 5%
R24, R25	030.13122		Resistor 1.2K ohm, 1/4w 5%
R22, R49	030.13822		Resistor 8.2K ohm, 1/4w 5%
R5, 6, 33 34	030.13823		Resistor 82K ohm, 1/4w 5%
R7, 8, 35 36	030.13683		Resistor 68K ohm, 1/4w 5%
R12, R40	030.13224		Resistor 220K ohm, 1/4w 5%
R55, R56	030.13272		Resistor 2.7K ohm, 1/4w 5%
R10, R38	030.13473		Resistor 47K ohm, 1/4w 5%
R18, R50	030.13472		Resistor 4.7K ohm, 1/4w 5%
R15, R42	030.13821		Resistor 820 ohm, 1/4w 5%
R20, R46	030.23825		Resistor 8.2M ohm, 1/2w 5%
R21, R48	030.23225		Resistor 2.2M ohm, 1/2w 5%
R11, R39	030.23106		Resistor 10M ohm, 1/2w 5%
K1, K2	131.02003		Reed Relay HE 721 c 12
XVR1, 2	329.04005		Heatsink
XIC	120.11421		Socket, IC 14 Pin
XQ	120.40411		Socket, Transistor
XQ	552.08001		Transistor Base, Nylon
	502.45101		Screw, PC Retainer; Flat Machine
	115.44003		Turret Mount Bridge (ABC DEF)

Figure 13.6 ELVI 820 PC 6 ANALOG BOARD



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elvi 820
PC 6.0 Locator
Fig.13.6 01/89

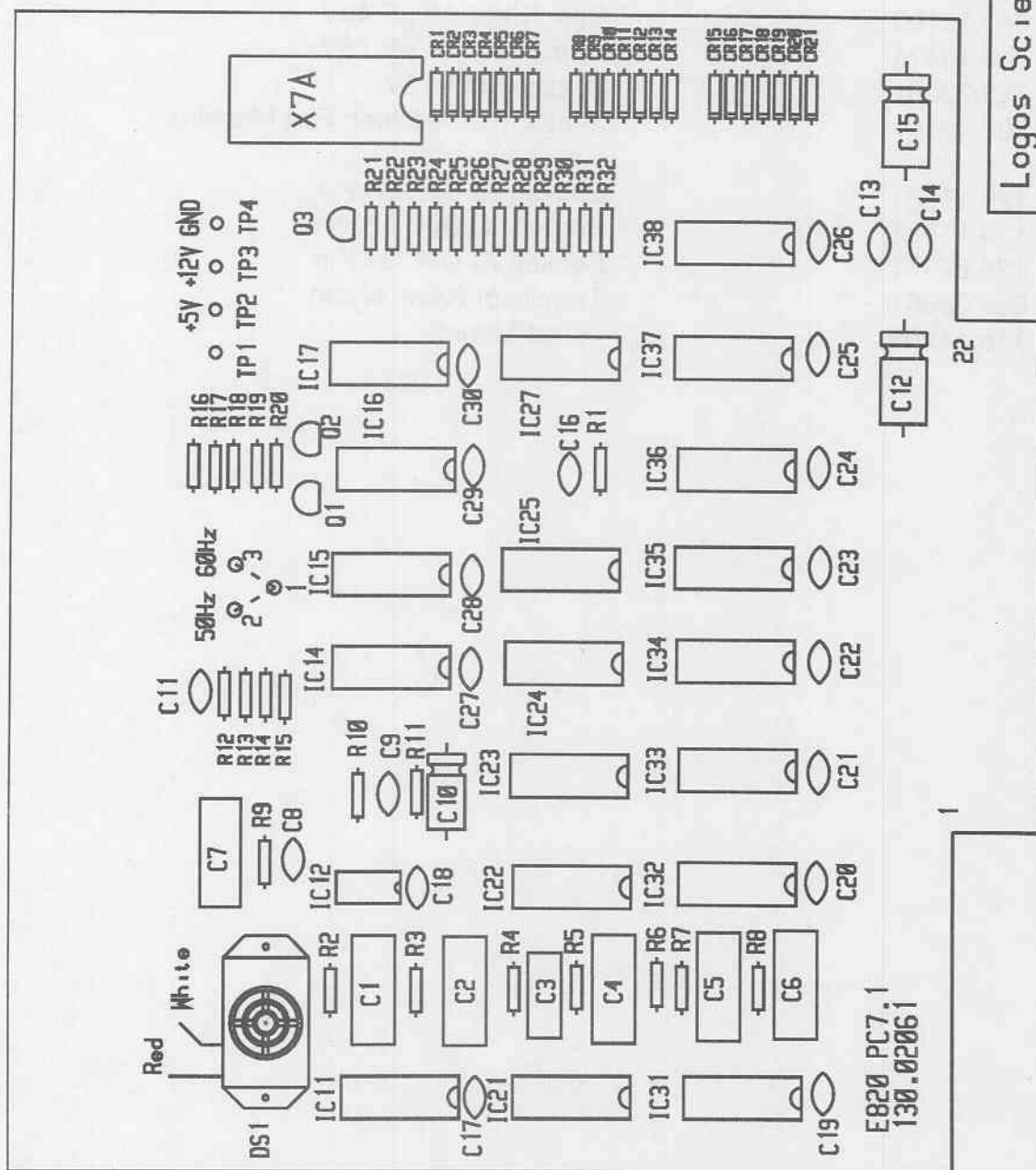
13.7 ELVI 820 PC 7 DIGITAL BOARD

REF.	CATALOG #	P/N	DESCRIPTION
PC 7.1	661.02061	OEM	PC 7.1 - Complete Board
PC 7.1	130.02061	OEM	PC 7.1 - Bare Board
IC17, 27 37	012.11050	CD 4050	Integrated Circuit Natl
IC11, 21 31	012.31028	CD 4528	Integrated Circuit Natl
IC16, 22 32	012.11027	CD 4027	Integrated Circuit Natl
IC38	012.11028	CD 4028	Integrated Circuit Natl
IC15	012.11018	CD 4018	Integrated Circuit Natl
IC33, 34, 35, 36	012.31010	CD 4510	Integrated Circuit Natl
IC14, 24	012.11081	CD 4081	Integrated Circuit Natl
IC25	012.11071	CD 4071	Integrated Circuit Natl
IC23	012.11093	CD 4093	Integrated Circuit Natl
IC12	010.03555	LM 555	Integrated Circuit Natl
CR1-CR21	001.10001	IN 914	Diode
Q1, Q2 Q3	080.11001	ECG 123AP	Transistor FBC 317
R1	030.13101		Resistor 100 ohm, 1/4w 5%
R12, R18	030.13561		Resistor 560 ohm, 1/4w 5%
R19	030.13102		Resistor 1K ohm, 1/4w 5%
R21	030.13122		Resistor 1.2K ohm, 1/4w 5%
R14, 16, 22, 29, 30, 31, 32	030.13103		Resistor 10K ohm, 1/4w 2%
R17, R20	030.13223		Resistor 22K ohm, 1/4w 5%
R23 - R28	030.13563		Resistor 56K ohm, 1/4w 5%
R10	030.13124		Resistor 120K ohm, 1/4w 5%
R2, R4	030.13274		Resistor 270K ohm, 1/4w 5%
R11	030.13334		Resistor 330K ohm, 1/4w 5%
R7	030.13474		Resistor 470K ohm, 1/4w 5%
R3	030.13564		Resistor 560K ohm, 1/4w 5%
R8	030.13684		Resistor 680K ohm, 1/4w 5%
R5, R9	030.13824		Resistor 820K ohm, 1/4w 5%
R6, 13, 15	030.13104		Resistor 100K ohm, 1/4w 5%
C9	044.36472		Ceramic Cap. 4.7 K pF
C3	044.36683		Ceramic Cap. 1 μ F
C8, C16	044.16103		Ceramic Cap. 10 K pF
C11, 13, 14, 17 - 30	044.16104		Tantalum Cap. 0.1 μ F 50V
C5	045.54474		Cap. Poly. 0.47 pF 100V
C6	045.75473		Cap. Poly. 0.047 μ F 250V

13.7 ELVI 820 PC 7 DIGITAL BOARD - Continued

REF.	CATALOG #	P/N	DESCRIPTION
C1	045.54684		Cap. Poly. 0.68 pF 100V
C2, 4, 7	045.54105		Cap. Poly. 1 μ F 100V
C10	040.26106		Cap. Elect. 10 μ F 40V
C12, 15	040.16474		Cap. Elect. 47 μ F 25V
DS1	123.23001		Buzzer SMB 12V
	502.45101		Screw, PC Retainer, Flat Machine
XIC	120.11421		Socket, IC DIP, 14 Pin
XIC	120.11621		Socket, IC DIP, 16 Pin
XIC	120.22411		Socket, IC DIP, 24 Pin
XQ	552.08001		Transistor Base, Nylon
	115.44003		Turret Mount

Figure 13.7 ELVI 820 PC 7 DIGITAL BOARD



Logos Scientific

0820

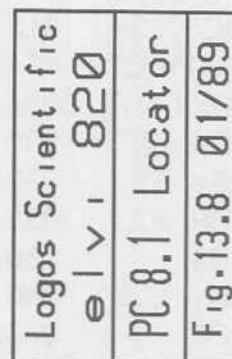
PC 7.1 Locator

Fig. 13.7 01/89

13.8 ELVI 820 PC 8 DISPLAY BOARD

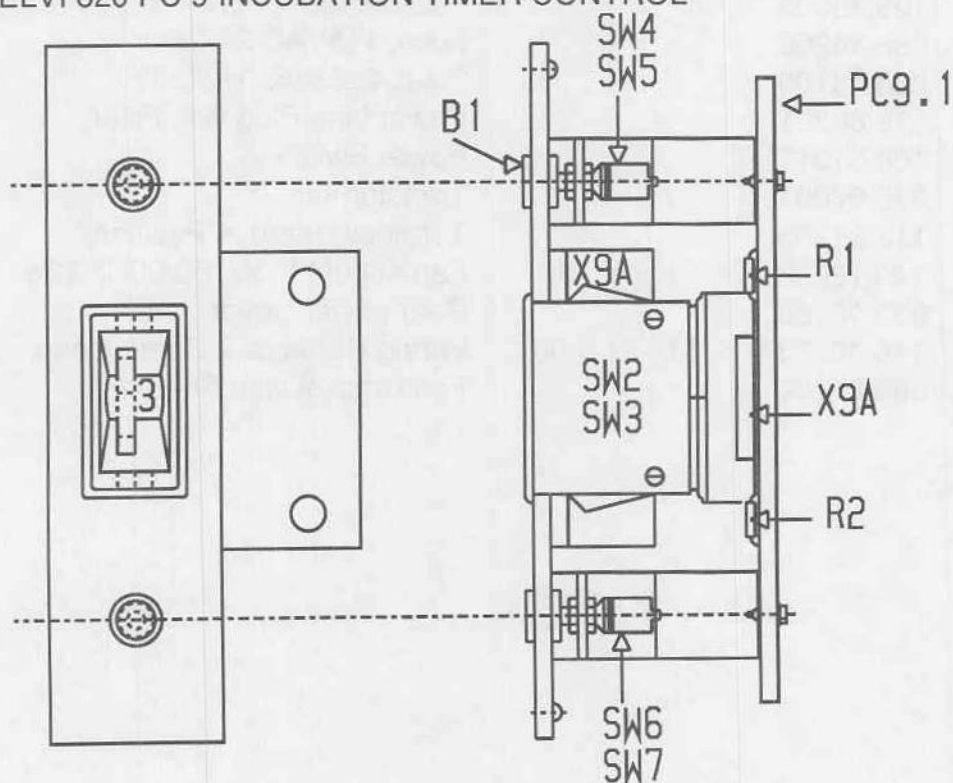
REF.	CATALOG #	P/N	DESCRIPTION
PC 8.1	661.02071	OEM	PC 8.1 Complete Board
PC 8.1	130.02071	OEM	PC 8.1 Bare Board
IC21-IC28	012.31011	CD 4511	Integrated Circuit Natl
IC32, 36	012.11002	CD 4002	Integrated Circuit Natl
IC33, 37	012.11093	CD 4093	Integrated Circuit Natl
IC11-IC18	034.10201	AB 314B102	Resistor Network, 7x 1K ohm
DY1-DY8	004.11002	ECG 3079	7 Segment Display
R4, R5	030.13471		Resistor 470 ohm, 1/4w 5%
R1, R2	030.13561		Resistor 560 ohm, 1/4w 5%
R6, R7	030.13562		Resistor 5.6K ohm, 1/4w 5%
R3	030.13104		Resistor 100K ohm, 1/4w 5%
C1	040.16226		Cap. Elect. 22 μ F 25V
C3	040.16107		Cap. Elect. 100 μ F 25V
C2, 4-9	044.16104		Tantalum Cap. 0.1 μ F 50V
DZ1, DZ2	002.12518	ECG 135A	Diode 1N751 5.1V, 1w
Q1, Q2	080.11001	BC 317	Transistor
DS3, DS5	003.21001	CMD 5763	Red Light, LED
DS2, DS4	003.22204	CMD 5453	Green Light, LED
DS1	003.23005	CMD 5353	Yellow Light, LED
X8A	120.24011	ICN-406-55-6	40 Pin Socket A & B Ansley
J8A	116.20321	MX-3192-3I	2 Pin Connector Molex
XDY1-8	120.52420		Socket, IC 24 Pin
XIC	120.11421		Socket, IC 14 Pin
XIC	120.11621		Socket, IC 16 Pin
XQ	552.08001		Transistor Base, Nylon

DATE: _____



13.9 ELVI 820 PC 9 INCUBATION TIME CONTROL

REF.	CATALOG #	P/N	DESCRIPTION
PC 9.1	661.02081	OEM	PC 9.1 - Complete Board
PC 9.1	130.02081	OEM	PC 9.1 - Bare Board
J9A	114.11121	CU 400 354	Connector, THUMBWHEEL SWITCH
SW2-SW3	105.80004	MB 731 S	THUMBWHEEL SWITCH Contraves
R1-R2	030.13102		Resistor 1K ohm, 1/4w 5%
SW4-5-6-7	100.60201	CK 8121ZB	Push-button Switch
B1	450.40010		White Cap, Switch
	659.00115		Wiring Harness
	602.50200		Bracket PC 9
X9A	203.02014		Socket DIP 14 Pin
XSW	119.11401		Spring Clip, Thumbwheel Switch

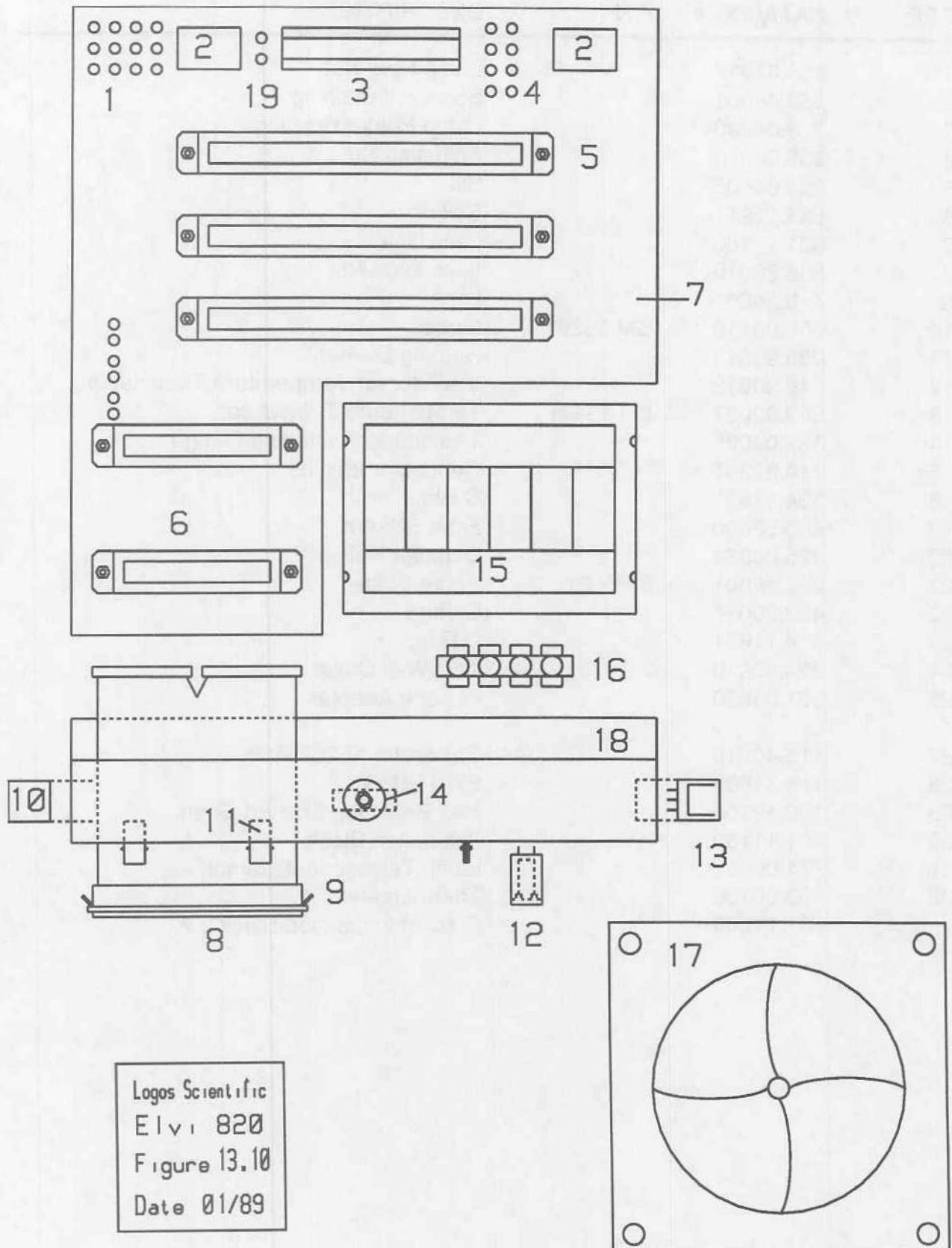
Figure 13.9 ELVI 820 PC 9 INCUBATION TIMER CONTROL

Logos Scientific
elvi 820
PC 9.1 Locator
Fig.13.9 01/89

13.10 ELVI 820 PC 10 INTERCONNECTION UNIT

REF.	CATALOG #	P/N	DESCRIPTION
PC 10	661.02090	OEM	PC 10 - Complete Board
1	114.22201		Connector 20 Pin - A1J
2	659.00103	TB 609-M1454	Connector 14 Pin - PC Mount
3	659.00104	TB 609-M407N	Connector 40 Pin - PC Mount
4	114.34053	F-CI 5-T-S	Connector 5 Pin - Shielded
5	114.21441		Connector 44 Pin - PC Mount
6	114.21201		Connector 20 Pin - PC Mount
7	130.02090		PC 10.1 - Bare Board
8	659.00105	TB 609-M245H	Connector 50 Pin - 821
9	119.20001	609-322	Retaining Clips
10	112.10524	09/0316/00/05	Connector 5 Pin - Pipette
11	112.30211		Connector BNC - Recorder
12	126.10002		Fuse Holder
	056.14200		Fuse, 115VAC 2A/250V
	056.14100		Fuse, 220VAC 1A/250V
13	112.80321		Power Line Plug with Filter
14	100.01011		Power Switch
15	070.07001		Transformer
16	113.31203		Terminal Board, 4 Position
17	140.12206		Fan 4600N 115V, 50/60Hz 20w
18	603.05100		Rear Lower Cover
19	116.40333	MX-21 9-03	Wiring Harness, 2 Cond. Conn.
	600.21300		Fan Bracket with Screen

Figure 13.10 ELVI 820 PC 10.1 INTERCONNECT BOARD

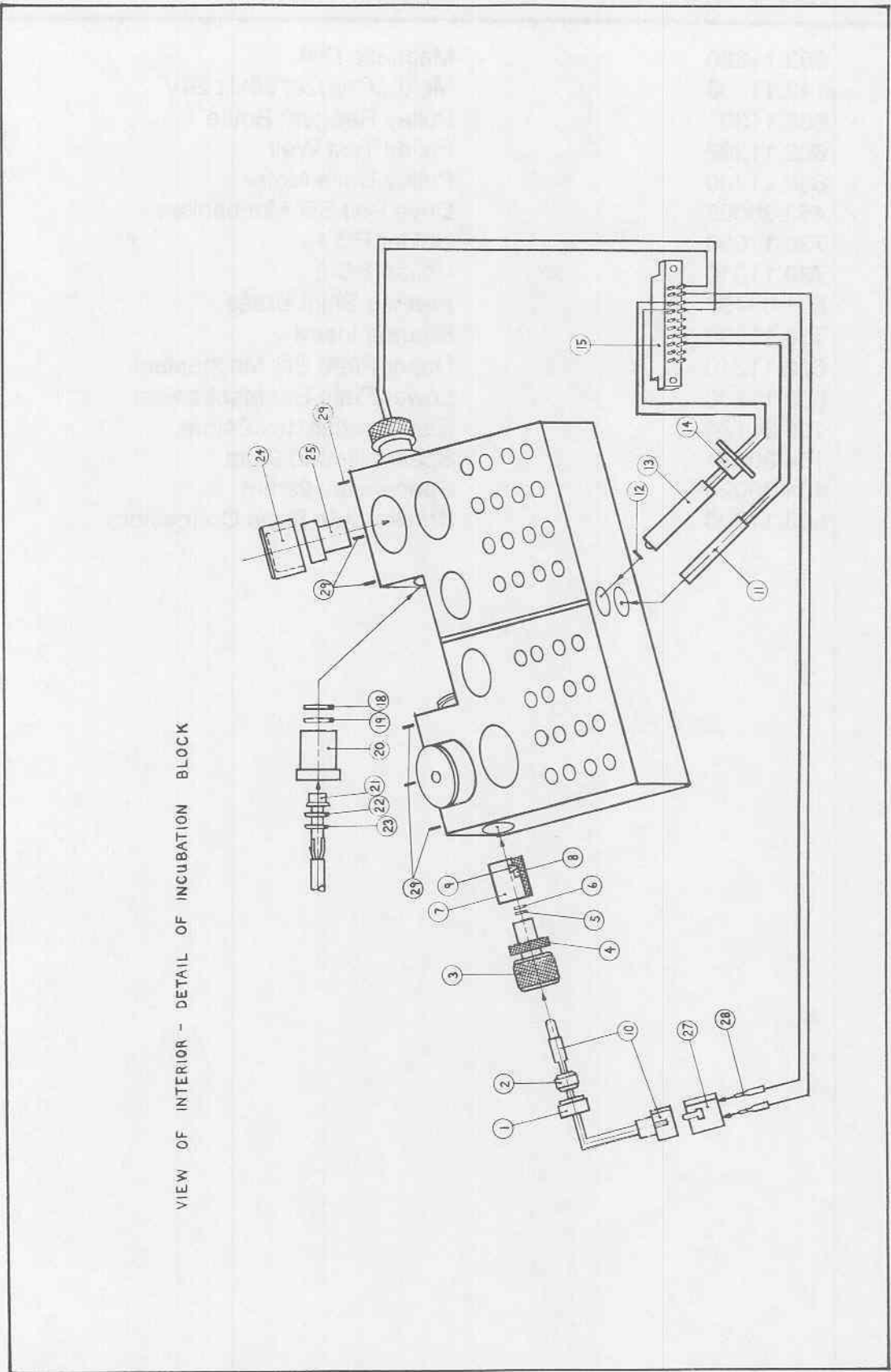


Logos Scientific
 Elvi 820
 Figure 13.10
 Date 01/89

13.11 ELVI 820 INCUBATION BLOCK

REF.	CATALOG #	P/N	DESCRIPTION
1	336.33017		Lamp Ring Nut
2	553.40001		Spherical Bushing
3	313.04040		Lamp Holder Bushing
4	336.04016		Adjusting Nut
5	233.04005		Slit
6	524.11211		C Ring
7	601.11180		Lens Unit
8	336.33015		Lens Lock-Nut
9	410.30001		Lens
10	659.00110	CM 2020	Lamp
11	035.90012		Heating Element
12	249.90012		Insulator for Temperature Transducer
13	659.00087	LM 334 H	Temperature Transducer
14	333.04025		Transducer Fastening Flange
15	114.22201		Connector 20 pins
18	524.11911		C Ring
19	400.52500		Filter 525 nm
20	325.80034		Detector Holder
21	051.10001	BPW 21	Photo Diode
22	452.20014		O-Ring
23	524.11611		C Ring
24	324.80010		Test Well Cover
25	301.04030		Cuvette Adapter
27	116.40216		Connector 16252 R1
28	115.31003		Pin 1561 GL
29	100.19100		Hex Retaining Screw 1.5mm
30	601.11100		Incubation Block
31	771.00001		Lamp Telescope Assembly
32	700.00100		Thermometer
	601.11000		Bracket Incubation Block x 2

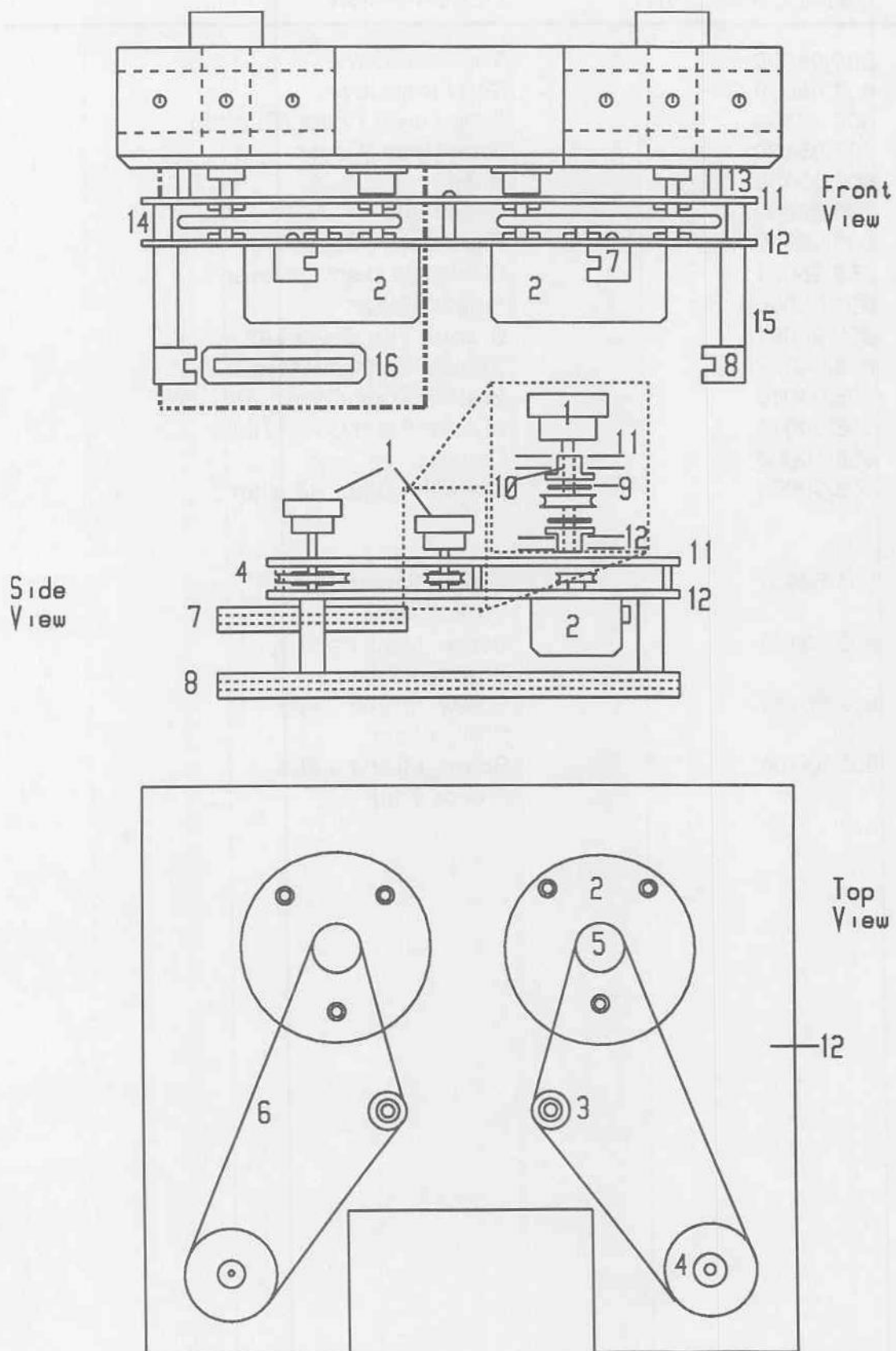
Figure 13.11 ELVI 820 INCUBATION BLOCK



13.12 ELVI 820 STIR MECHANISM

REF.	CATALOG #	P/N	DESCRIPTION
1	602.11320		Magnetic Disk
2	142.11403		Motor, Crouzet 60Hz 24V
3	602.11301		Pulley Reagent Bottle
4	602.11302		Pulley Test Well
5	602.11300		Pulley Drive Motor
6	452.30008		Drive Belt Stir Mechanism
7	730.11050		Holder PC 1
8	730.11010		Holder PC 2
9	521.00490		Bearing Shim Brass
10	730.11300		Bearing Insert
11	602.11210		Upper Plate Stir Mechanism
12	602.11200		Lower Plate Stir Mechanism
13	105.31124		Stud Spacer Hex 24mm
14	104.30024		Spacer Round 9mm
15	104.30028		Spacer Hex 28mm
16	603.11000		Bracket with Edge Connectors

Figure 13.12 ELVI 820 STIR MECHANISM



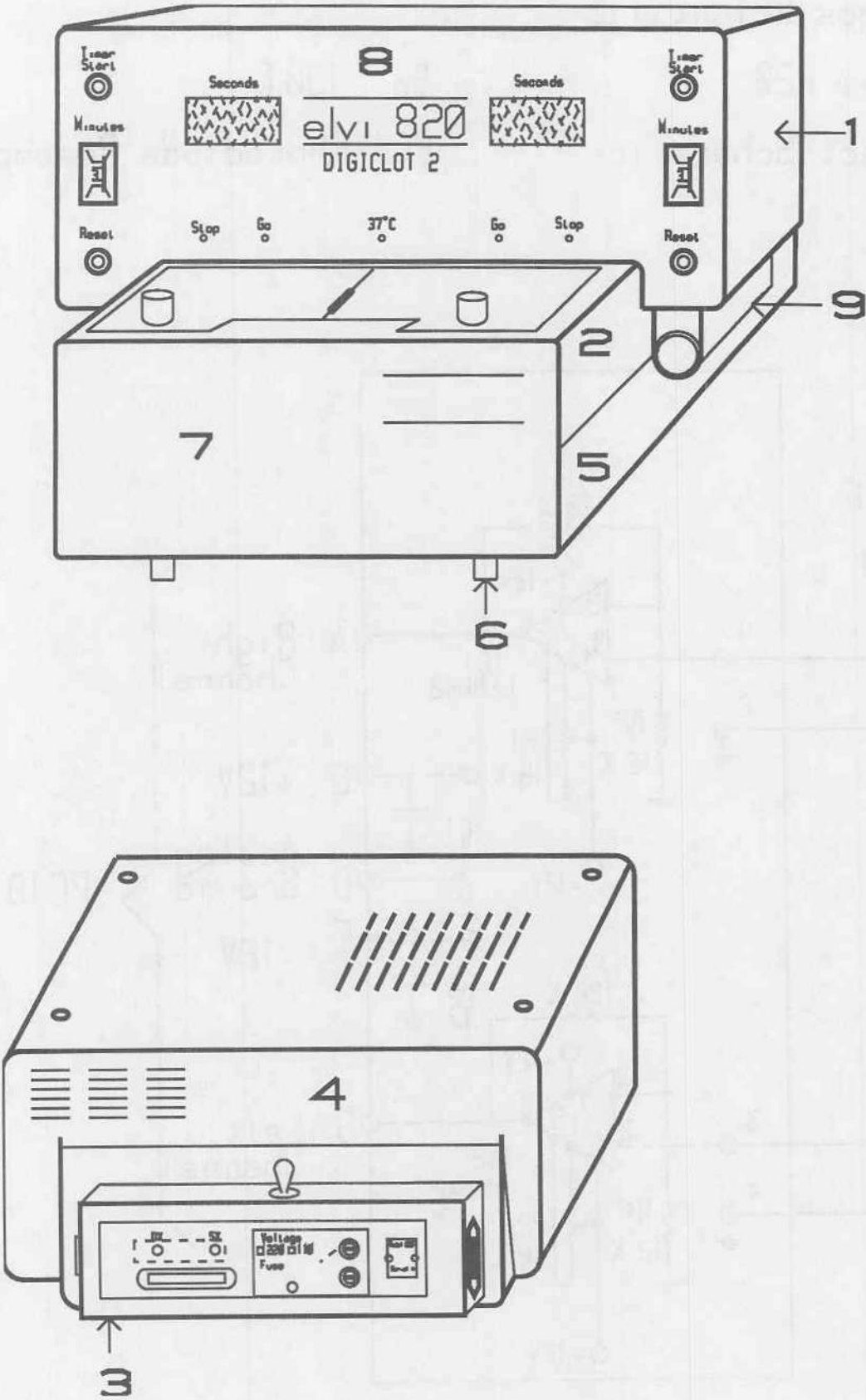
13.13 ELVI 820 COVERS AND MISCELLANEOUS PARTS

REF.	CATALOG #	P/N	DESCRIPTION
1	601.04000		Top Rear Cover
2	601.05010		Top Front Cover
3	603.05100		Rear Lower Cover (Control)
4	601.05120		Rear Upper Cover
5	601.05100		Base
6	700.20000		Base Feet
7	601.05110		Front Lower Cover
8	258.95061		Plexiglass Display Cover
9	601.03000		Pipette Holder
	606.04001		Bracket Top Cover Left
	606.04002		Bracket Top Cover Right
	606.04010		Bracket Front Cover Left
	606.04011		Bracket Front Cover Right
	606.40000		Chassis
	103.30000		Nut with Spring Retainer

Cover Screws:

501.52931	Screw, Selftap Flat, Phillips 1cm
502.55141	Screw, Machine Flat, Phillips 1.2cm
502.55121	Screw, Machine Flat, Phillips 1cm
502.55101	Screw, Machine Flat, Phillips 7mm

Figure 13.13 CASE COVERS



Schematic PC 1 Photo Diode Preamp Board

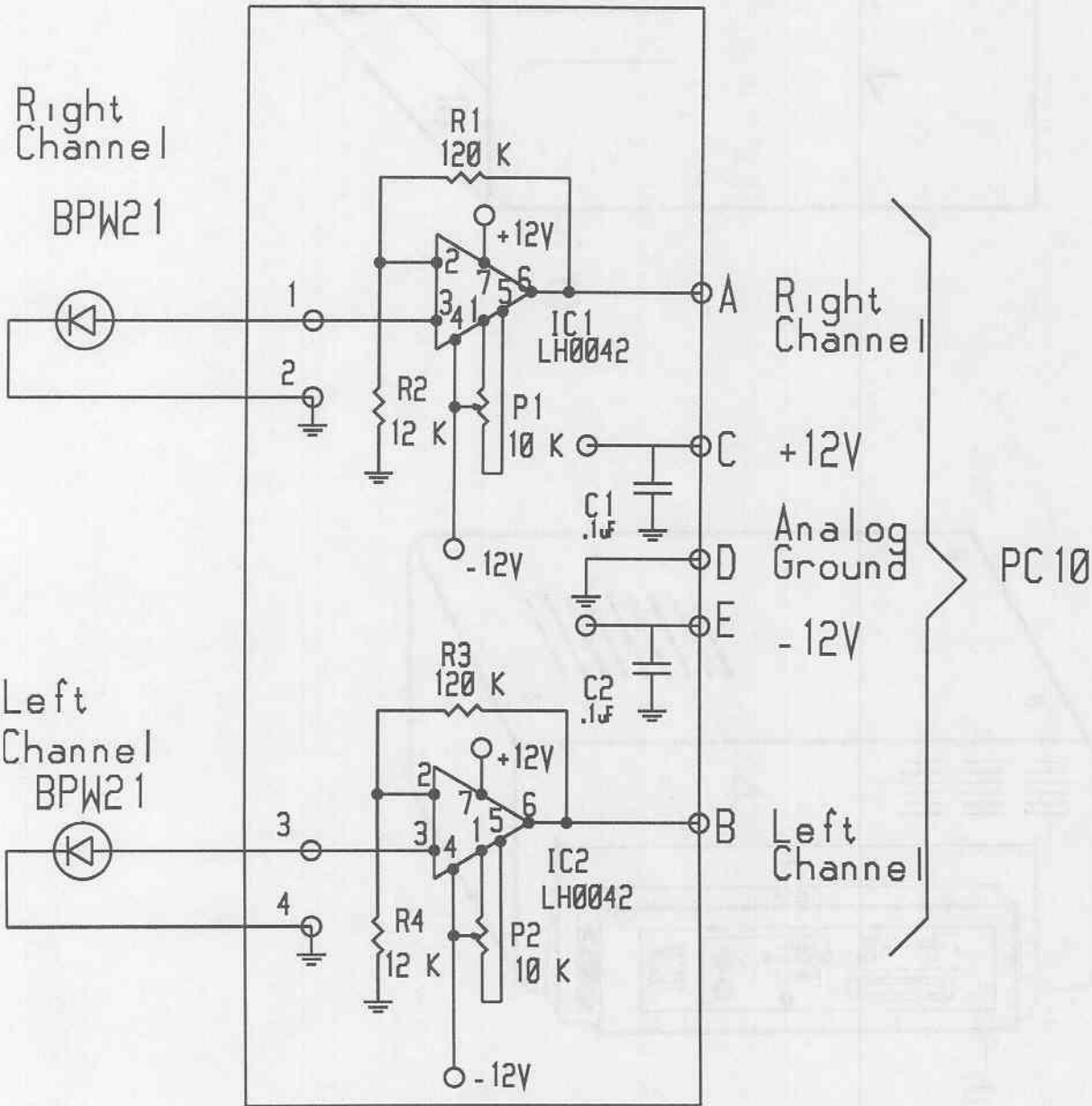
Logos Scientific

Elvi 820

Elect Schematic

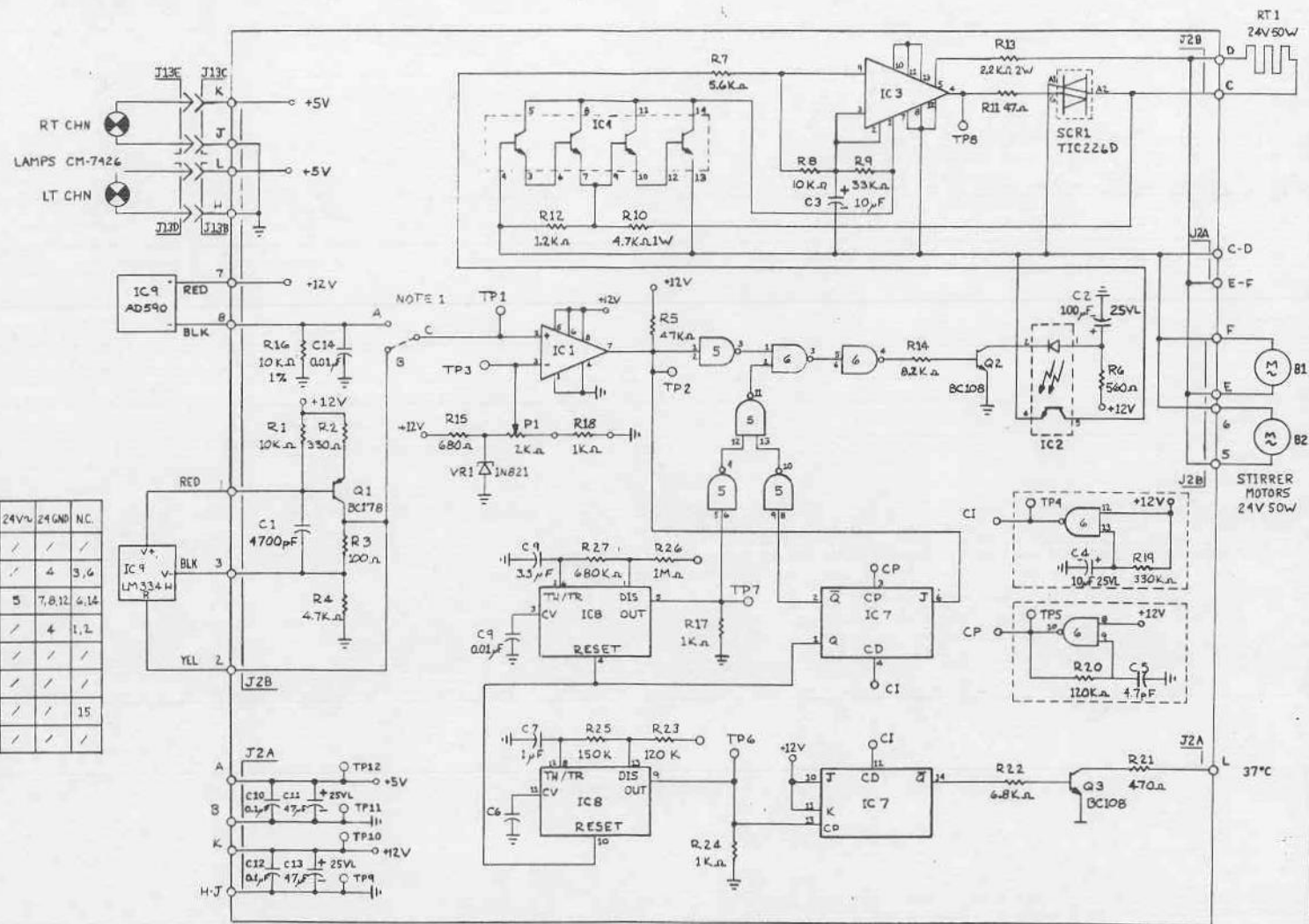
Sn 1301+

PC1 Photodiode Preamp

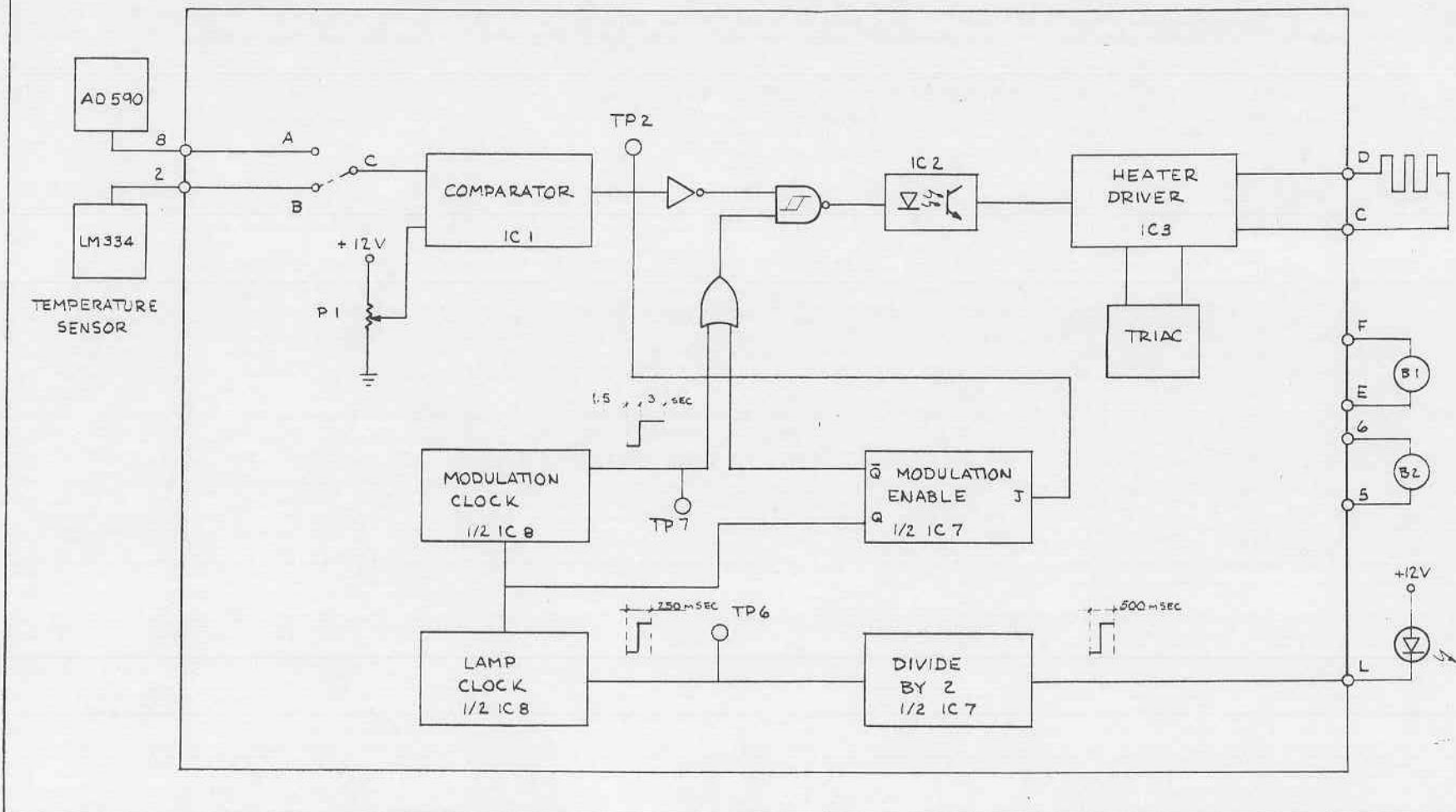


Logic Diagram PC 2.1 Temperature Control Board

IC	TYPE	+12V	+5V	6ND	24V~	24VND	NC
1	LM311	5,6,8	/	1,4	/	/	/
2	FCD820	/	/	/	4	3,6	/
3	CA3059	/	/	/	5	7,8,12	6,14
4	CA3086	/	/	/	4	1,2	/
5	4011	14	/	7	/	/	/
6	4093	8,12,14	/	7	/	/	/
7	4027	10,11,16	/	5,7,8,9	/	/	15
8	LM556	14	/	7	/	/	/



ELV1 820 DIGICLOT 2	DATE: 6 JAN '86
LOGIC DIAGRAM	DRW No: 701.01230A
PC 2.1 Temperature Control Board	SN No: 130 -
	PG No:



ELVI 820 DIGICLOT 2

DATE : 5 JAN '86

ELECTRICAL SCHEMATIC

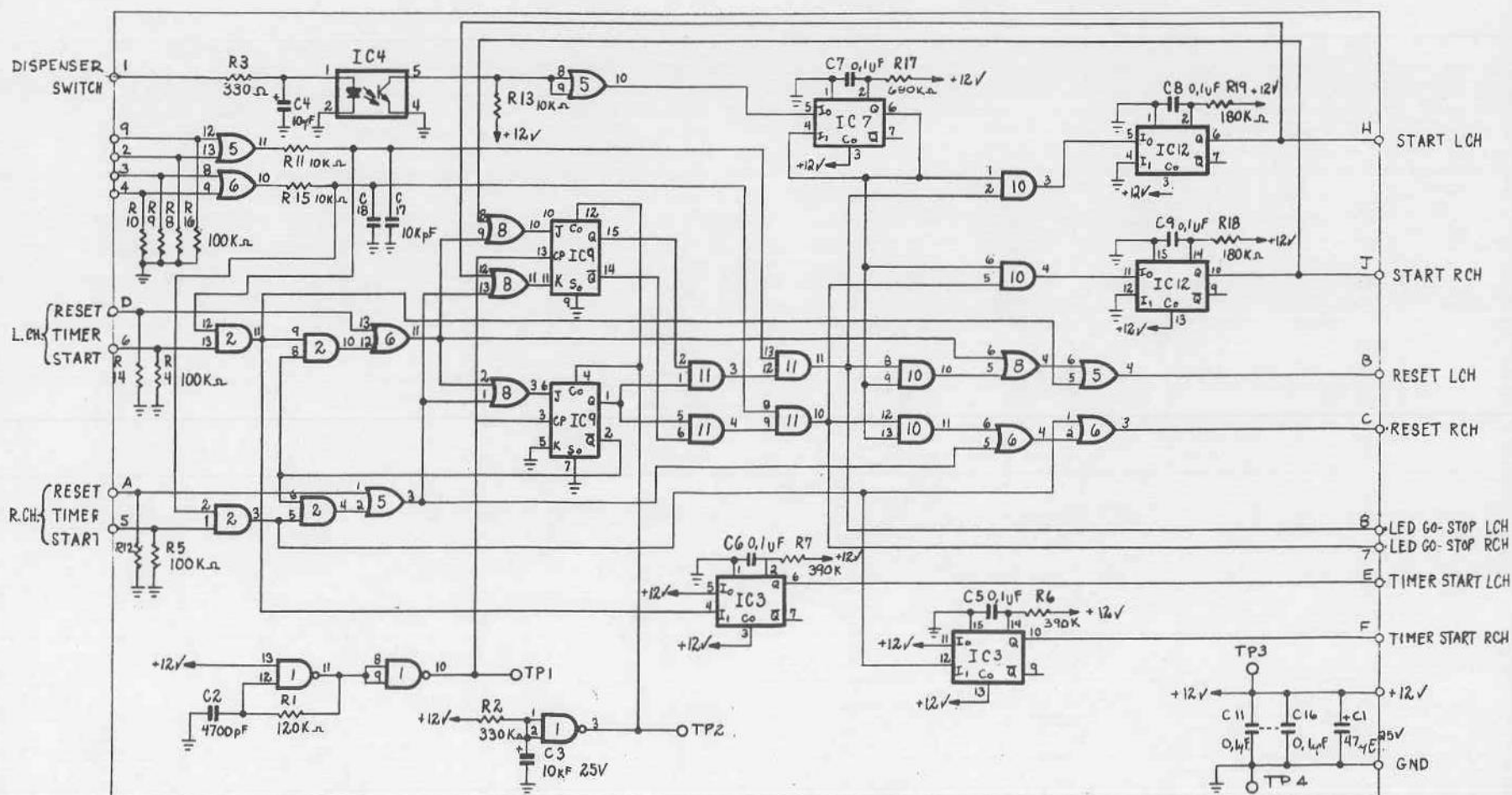
DRAWING NO. : 702.03844 A

SERIAL NO. : 1301 -

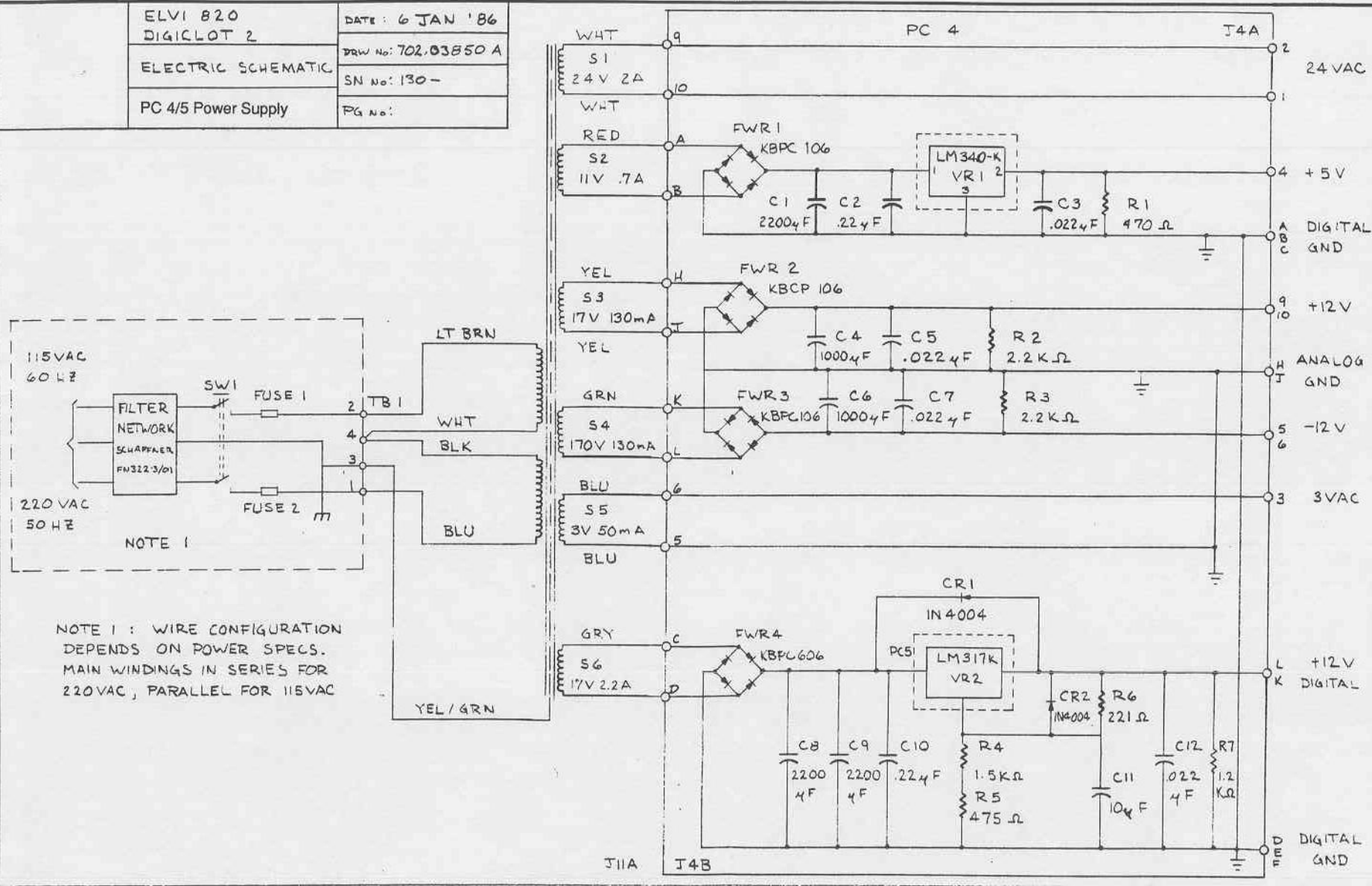
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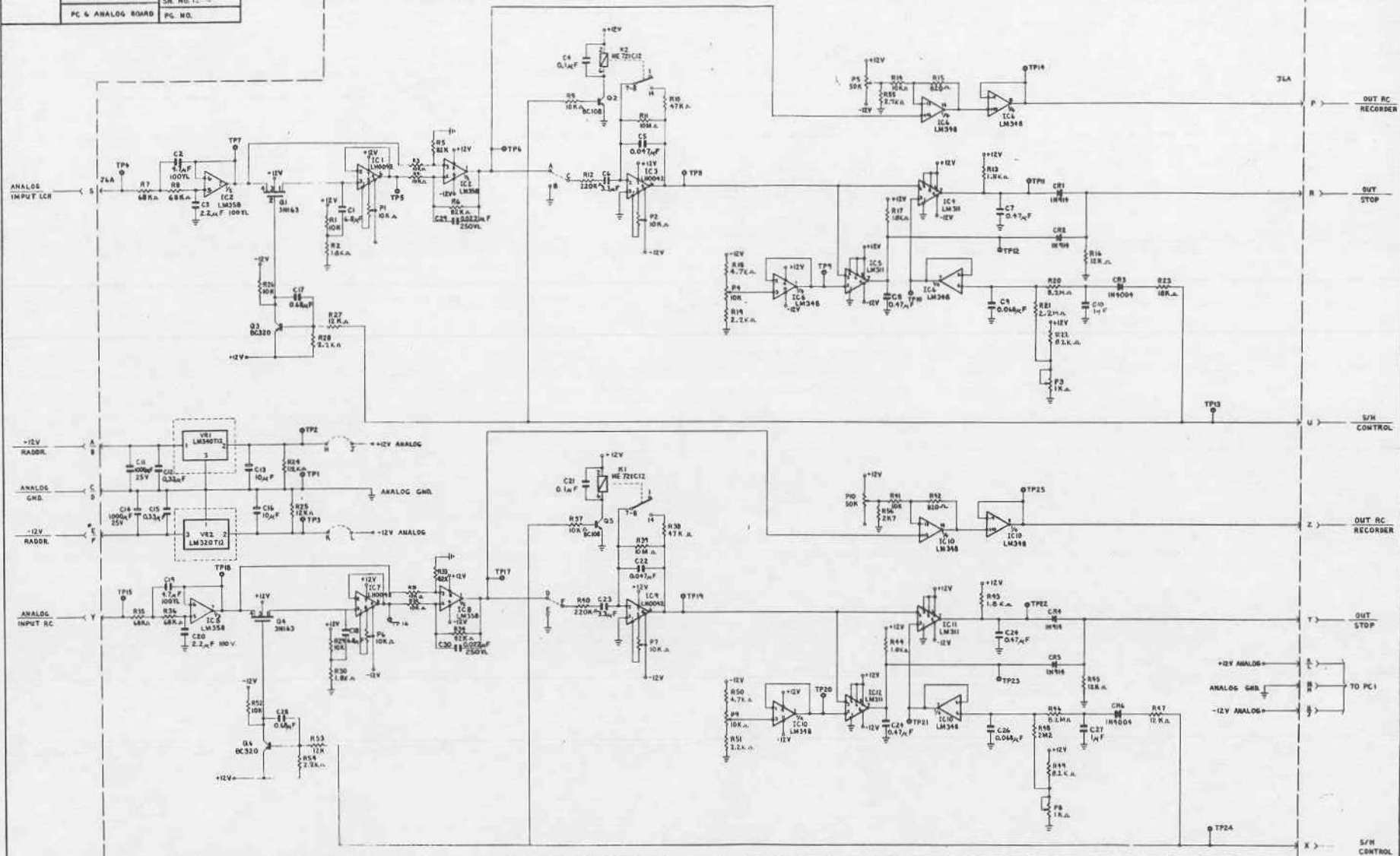
PC 3.4 Electric Start Card

IC	COMPONENT	6ND	+12V	IC	COMPONENT	6ND	+12V
1	4093	7	14	8	4071	7	14
2	4081	7	14	9	4027	8	16
3	4528	8	16	10	4081	7	14
4	EC43040			11	4081	7	14
5	4071	7	14	12	4528	8	16
6	4071	7	14				
7	4528	8	16				

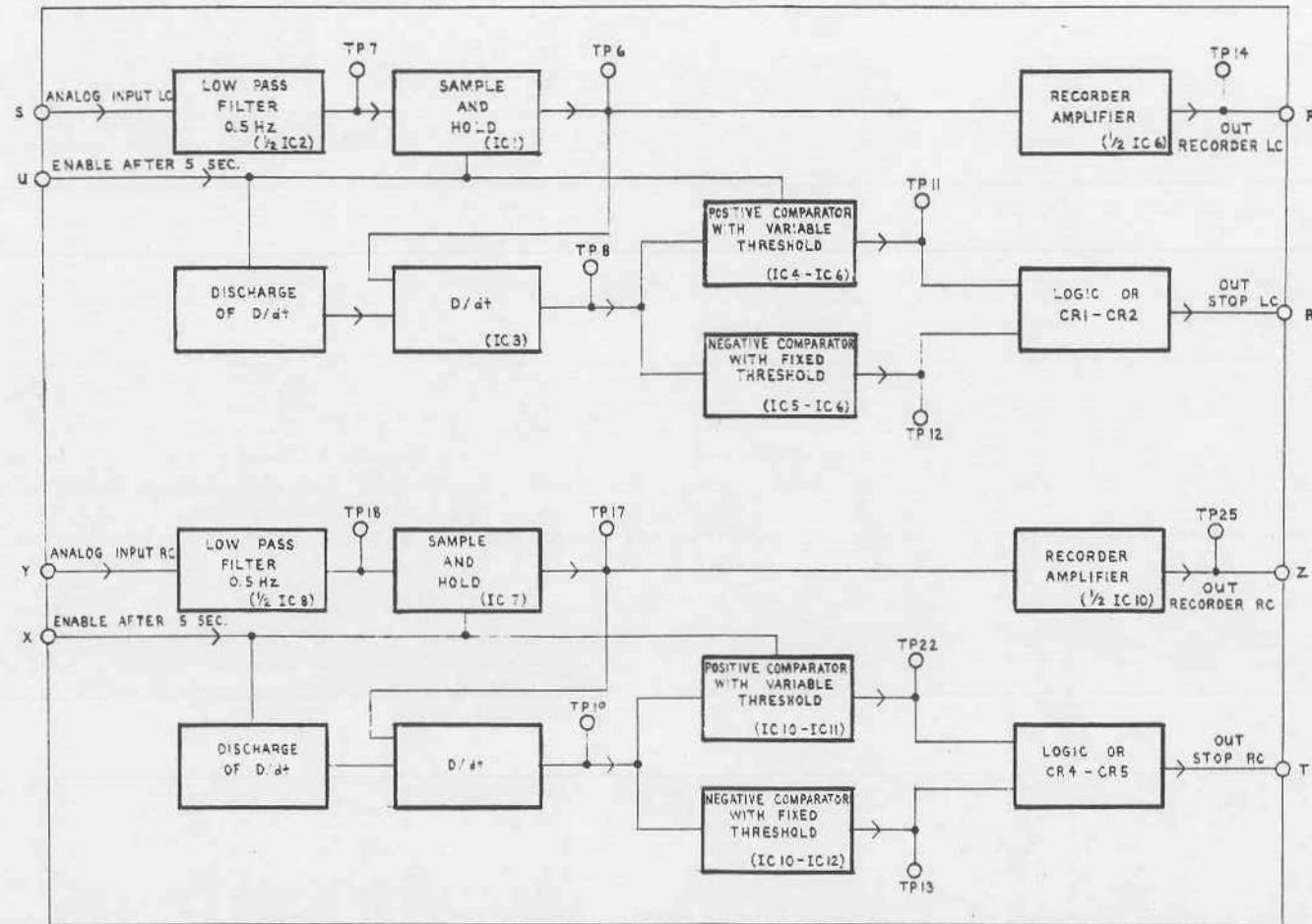


ELVI 820 DIGICLOT 2	DATE: 6 JAN '86
ELECTRIC SCHEMATIC	DRW No: 702.03850 A
PC 4/5 Power Supply	SN No: 130-
	PG No:





DIGICLOT 2	DATE: 2 JAN 68
LOGIC DIAGRAM	DRW. NO. 79.01250A
	SN. NO. 130-
PC 6 Analog Board ARB	PG. NO.

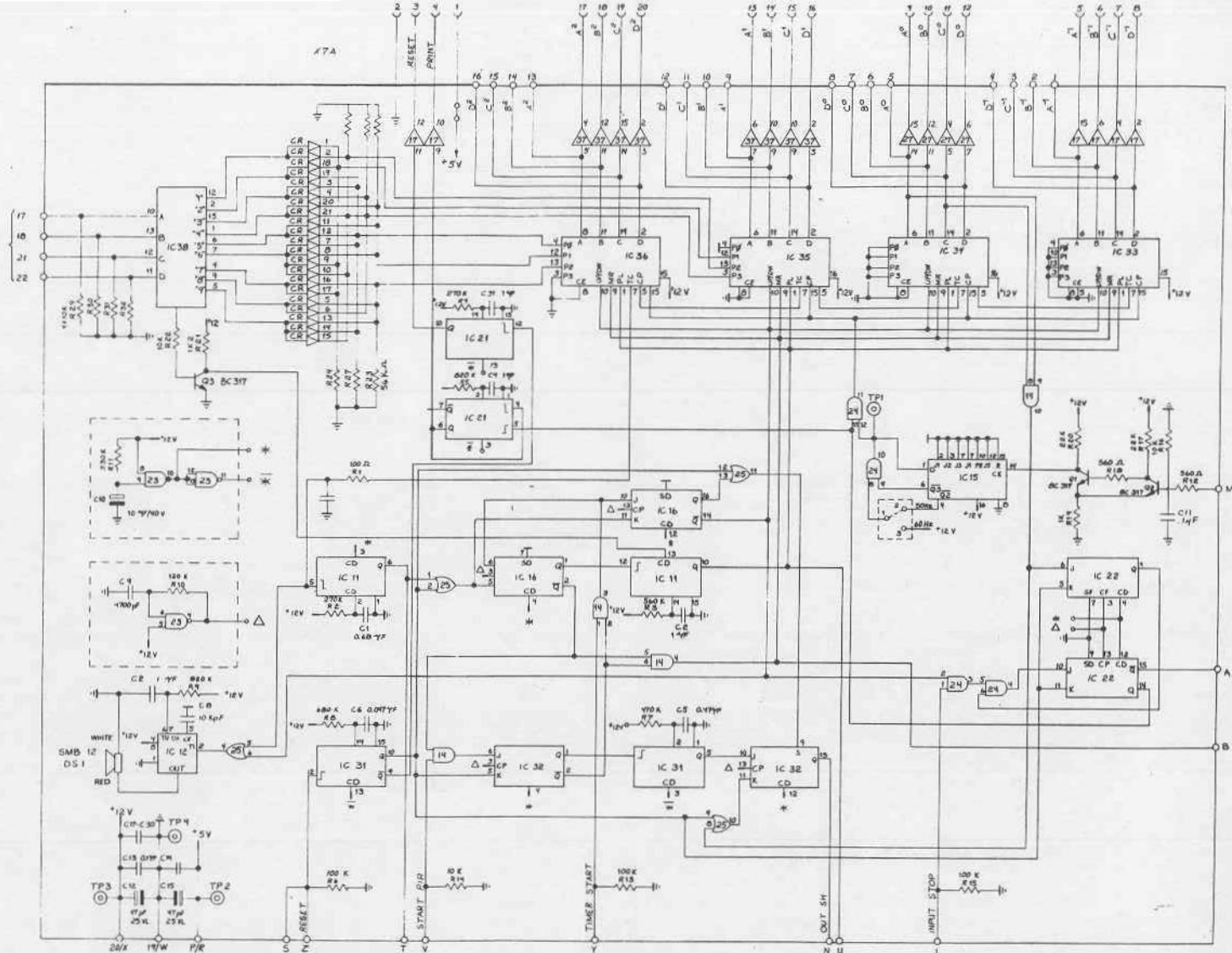


Schematic PC 7.1 Digital Board

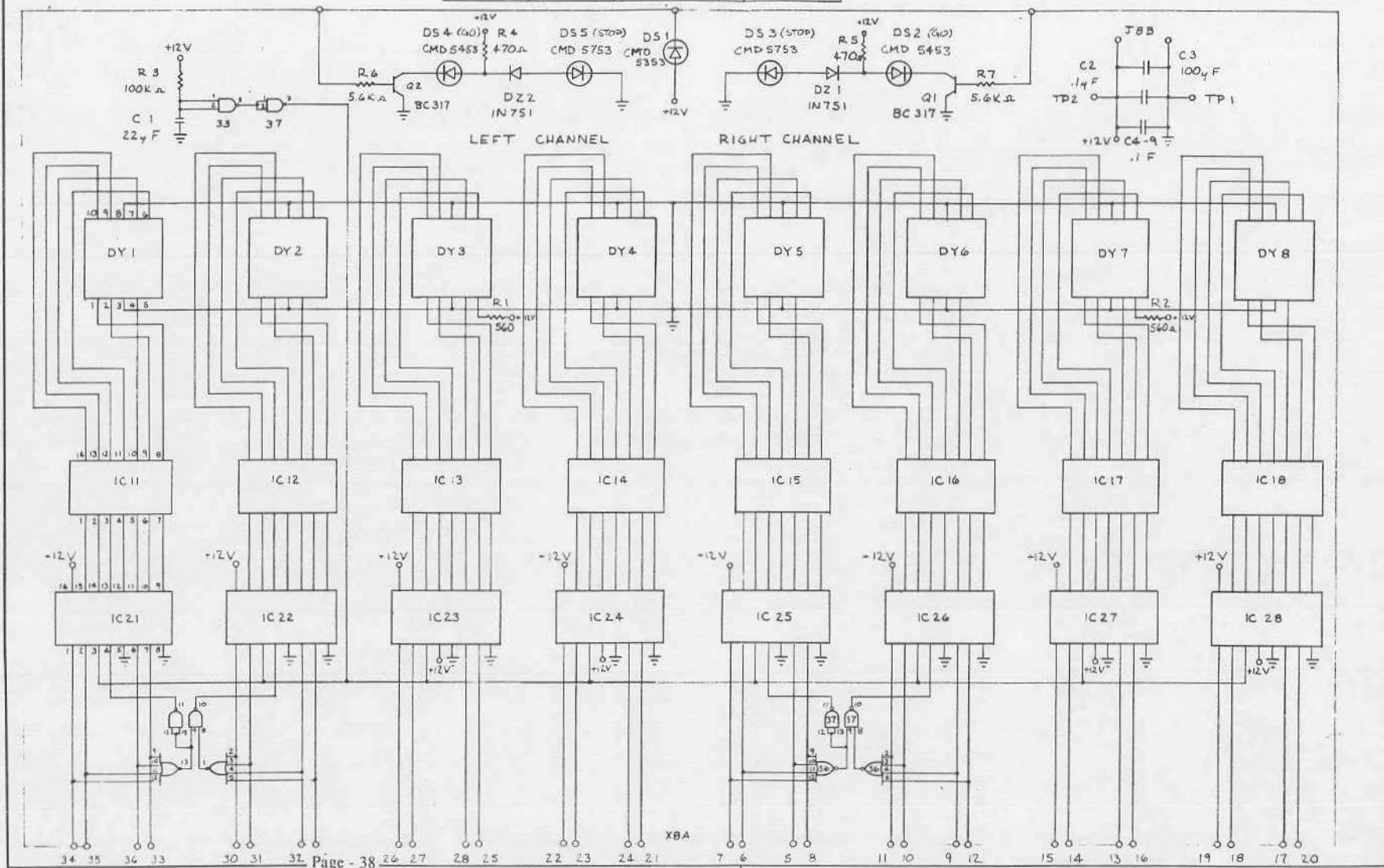
IC	COMPONENT	PINS AT +12V	PINS AT GROUND	PINS AT +5V	NOT USED
11	4520	11, 16	1, 6, 15		7, 9
12	4555	4, 8	1		
14	4081	14	7		
15	4010	16	2, 10, 13, 14		SR13
16	4027	16	7, 8, 9		
17	4050	16	8	1	13
21	4520	11, 16	1, 6, 15		9
22	4027	16	7, 8, 9		1, 15
23	4093	14	7		1, 2, 3
24	4081	14	7		
25	4091	14	7		
27	4050	16	8	1	13
31	4520	11, 16	1, 6, 15		7, 9
32	4027	16	7, 8		14
33	4510	16	3, 4, 5, 6, 12, 13		
34	4510	16	7, 8		
35	4510	16	4, 8		
36	4510	16	3, 8		
37	4050	16	8	1	13
38	4020	16	8		

NOTE

FROM MINUTES
THUMBWHEEL
SWITCH



IC 1,2,4,6,8	FND 500			
DY 3,7	FND 500			
IC 11,18	AB314A102			
IC 21,22,25,26	4511	16	5,8	/
IC 23,24,27,28	4511	4-16	5,8	/
IC 32,36	4002	14	7	6,8
IC 33,37	4093	14	5,6,7	/



Schematic PC 9 Incubation Time Control

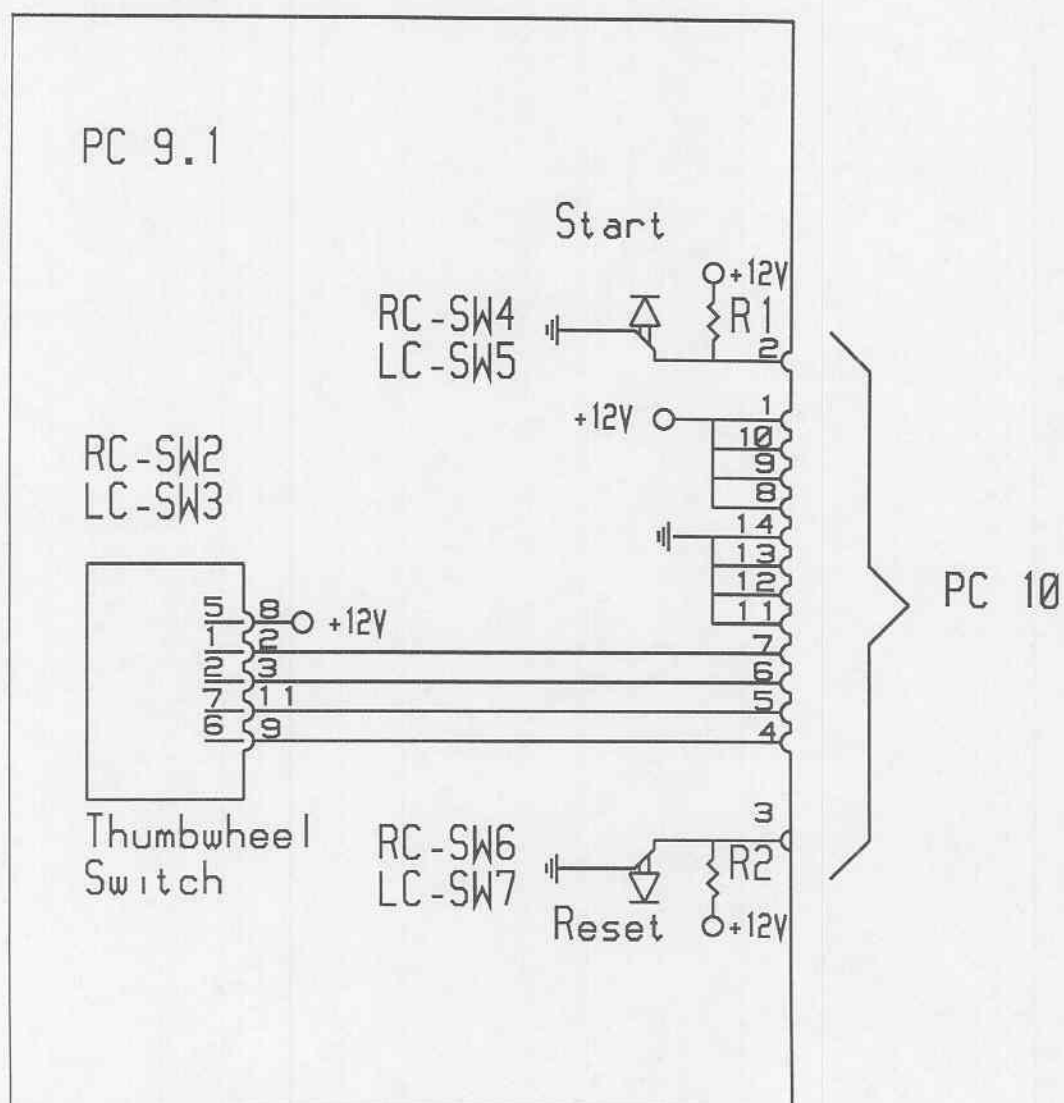
Logos Scientific

Elvi 820

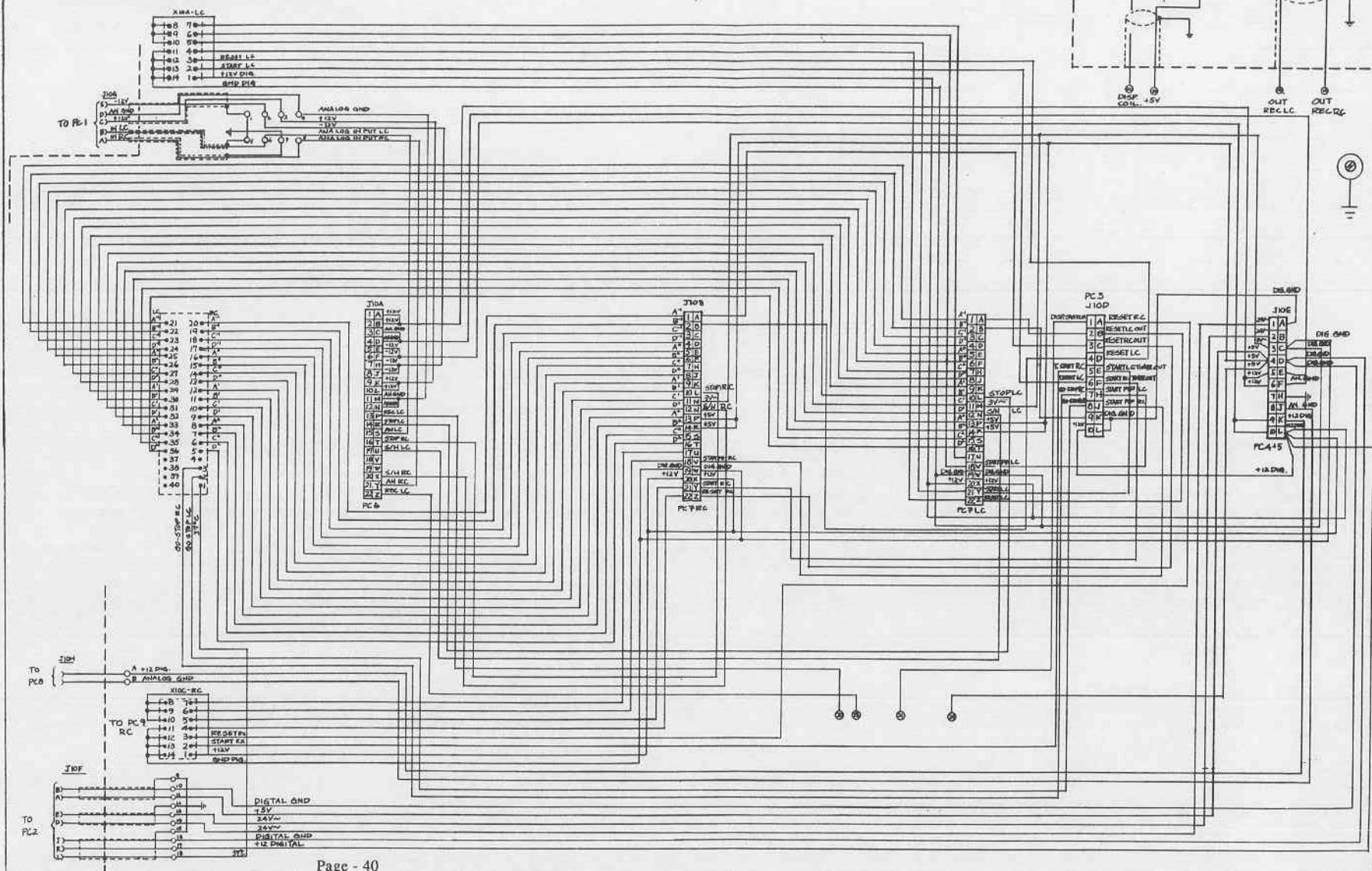
Sn 1301+

Elect Schematic

PC9 Incubation Timer



Schematic PC 10 Interconnection Board





820 PROCEDURE SUMMARY

The ELVI 820 is a dual-channel instrument designed to perform coagulation tests. Each sample is monitored by a photometric system started by an electrical signal coming from the pipette delivering the reagents or plasma. The rate of change in the optical density as fibrin forms is detected by the system and stops the timer.

Instrument Specifications

Input voltage: 115 volts, 60 Hz

Thermostat control: 37° C $\pm$ 0.5°C.

Min. readout time: 5 sec.

Max. readout time: 999.9 seconds

Daily Start Up Procedures

1. Switch on the power and allow 30 minutes for the instrument to warm-up.
2. Verify the operating temperature by checking the temperature indicating light (it will pulsate regularly).
3. Perform standard laboratory control checks on both channels before testing patient's plasma.

NOTE: THIS SHEET PROVIDES SIMPLIFIED GUIDELINES FOR OPERATING THE ELVI 820 DURING ROUTINE COAGULATION TESTS. PLEASE REFER TO THE OPERATOR'S MANUAL FOR MORE DETAILED INSTRUCTIONS.

PT Operating Procedure (Testing usually done in Duplicate)

1. Incubate the PT Reagent in the 820 thermostat well for at least 15 minutes or until the reagent has been brought to 37°C. Pipette 0.2 ml of PT Reagent into each cuvette and place in the incubator for 3 minutes.
2. Raise the drilled cover of the measuring well and firmly seat the first cuvette with the PT Reagent into the test well. Put the cover back into position. Confirm that the channel in use is ready (green lamp on); if not, (red lamp on), press the RESET button.
3. With the automatic pipette, pick up 0.1 ml of the test plasma and insert the end of the pipette into the hole in the test well cover. Deliver the plasma by pressing the pipette push-button firmly. Be sure to press pipette button to the second stop.
4. Then proceed to the second channel (after starting the first one), following the same operating procedure.
5. For each channel, the timer will start automatically and stop on formation of the clot. Repeat the procedure for each sample.

APTT Operating Procedure (Testing usually done in Duplicate)

1. Put an aliquot of Calcium Chloride into the incubation block. Pipette 0.1 ml of the test plasma into a cuvette, add 0.1 ml of the APTT reagent, agitate slightly and put the cuvette into the incubation block: allow to incubate for 3 or 5 min. - see reagent package insert.
2. Raise the drilled cover of the test well and firmly seat the first cuvette containing the plasma + APTT reagent mixture into the test well. Put the cover back into position.
3. Confirm that the channel in use is ready (green lamp on); if not, (red lamp on), press the RESET button.
4. With the electric pipette, pick up 0.1 ml of the 37°C Calcium Chloride and insert the end of the pipette into the hole in the test well cover.
5. Deliver the Calcium Chloride by pressing the pipette push-button firmly. Be sure to press pipette to second stop.
6. Then proceed to the second channel (after starting the first one), following the same operating procedure. For each channel the timer will start automatically and stop on formation of the clot.

ELVI 820 Digiclot II Supplies:

Supplies for the Digiclot II are available from your local distributor or
LOGOS SCIENTIFIC, INC. (800) 821-2495 or (702) 565-1383.

Please use these numbers when ordering supplies:

DESCRIPTION	CATALOG NUMBER
Adjustable pipette	659.00129
100 ul ELVI pipette	941.97000
200 ul ELVI pipette	941.97100
Package of 5 magnetic stir bars	679.00009
Box of 1000 cuvettes/no stir bars	675.06001
Box of 1000 pipette tips	675.05001
Package of 500 micro agitators	679.00011
Work Station	658.00108

PRECAUTION: DO NOT USE OXALATED PLASMA. USE ONLY ELVI PIPETTES, TIPS AND CUVETTES FOR OPTIMUM RESULTS.

For technical assistance or service, call:

LOGOS SCIENTIFIC, INC.

700 Sunset Rd. Henderson, NV 89015

(800) 821-2495 In Nevada: (702) 565-1383